AFRICA AND HUNGER: PROSPECTS FOR SUSTAINABLE DEVELOPMENT IN SUB-SAHARAN AFRICA

HEARINGS

BEFORE THE

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OF THE

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CONTENTS

WITNESSES

Page

September 19, 1985:

Dr. Sharon E. Nicholson, Department of Meteorology, Florida State University; Dr. Eugene M. Rasmusson, Climate Analysis Center, National Oceanic and Atmospheric Administration; Dr. Joan C. Hock, Director, Assessment and Information Services Center, National Environmental Satellite, Data, and Information Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce; and Dr. Jagadish Shukla, Department of Meteorology, University of Maryland 6

October 17, 1985:

Dr. Michael S. Teitelbaum, program officer, Alfred P. Sloan Foundation 142
Hon. Marshall Green, former Ambassador to Indonesia and Australia 151
Stephen Isaacs, director, Development Law and Policy Program, Center for Population and Family Health, Columbia University 159
Werner Fornos, president, the Population Institute 179
Dr. J. Joseph Speidel, vice president, the Population Crisis Committee 195
Nancy Harris, deputy director, Private Enterprise Family Project, John Snow, Inc 206
Virginia Ofosu-Amaah, former principal secretary of external economic relations, Ministry of Finance and Economic Planning of Ghana 213
Dr. Sheldon Segal, director, Population Sciences Division, Rockefeller Foundation 224

October 23, 1985:

James Gustave Speth, Ph.D., president, World Resources Institute 243
Ed Asner, Africa Tomorrow; Richard Dreyfuss, Africa Tomorrow; Paul Winchell, Ph.D., Africa Tomorrow; Henry Heimlich, M.D., Africa Tomorrow 325
Lloyd Timberlake, editorial director, Earthscan 347
Dr. Cynthia Irwin-Williams, executive director, Social Services Center, Desert Research Institute; John Michael Kramer, program coordinator, Renewable Natural Resources, Care, Inc.; and James G. Kamusikiri, professor, California State Polytechnic University 362

October 30, 1985:

Dr. Nyle C. Brady, senior assistant administrator, Bureau for Science and Technology, Agency for International Development 433
Albert Meisel, executive director, League for International Food Education 500
Dr. James Aronson, professor of botany, Institute of Applied Research and Desert Farms Unit, Blaustein Institute of Desert Research, Ben-Gurion University of the Negev, Beer Sheva, Israel 513
Peter Freeman, consulting geographer 525
Perdita Huston, author and journalist 549
Elise Fiber-Smith, executive director, OEF International 556
Dr. Christine Obbo, assistant professor, Amthropology Department, Wheaton College 572

October 31, 1985:

Lester R. Brown, president, Worldwatch Institute 590
Mark L. Edelman, assistant administrator for Africa, Agency for International Development; Steven W. Sinding, Ph.D., director, Office of Population, Bureau of Science and Technology, Agency for International Development 607

October 31, 1985—Continued Page
Loret Miller Ruppe, director, Peace Corps; accompanied by Martin Mueller, Africa Regional Director; George Mahaffey, Forestry Sector Specialist; John Zarofonetis, coordinator, Africa Food Systems 748

APPENDIX

1. Statement submitted for the record by the Agency for International Development, September 19, 1985 831
2. Congressional Research Service summary, "Monitoring and Forecasting Drought and Famine" 848
3. Statement submitted for the record by Robert Rodale, chairman of Rodale Press and president of the Rodale Institute, October 30, 1985 877
4. Statement submitted for the record by Hon. Mickey Leland, October 31, 1985 882
5. "Science and Technology for a Sustainable African Agriculture," by Charles Weiss, Science and Technology Adviser, World Bank 888
6. Letter to Hon. James H. Scheuer, from Mark L. Edelman, Bureau for Africa, Agency for International Development 898
7. Questions and answers—September 19, 1985:
    Dr. Sharon Nicholson, Department of Meteorology, Florida State University 920
    Dr. Eugene M. Rasmusson, Diagnostics Branch, Climate Analysis Center, National Oceanic and Atmospheric Administration 922
    Dr. Joan C. Hock, Director, Assessment and Information Services Center, National Oceanic and Atmospheric Administration 925
    Dr. Jadadish Shulka, Department of Meteorology, University of Maryland 930
8. Questions and answers—October 17, 1985:
    Hon. Marshall Green, Ambassador (retired) 934
    Stephen Isaacs, director, development law and policy program, Center for Population and Family Health, Columbia University 943
    Werner Fornos, president, Population Institute 946
    Dr. J. Joseph Speidel, vice president, Population Crisis Committee 952
    Virginia Ofosu-Amaah, former principal secretary, External Economics Relations, Ministry of Finance and Economic Planning, Ghana .. 957
9. Questions and answers—October 30, 1985:
    Perdita Huston, author and journalist 961
    Dr. Christine Obbo, assistant professor, Anthropology Department, Wheaton College 967
    Elise Smith, executive director, OEF International 971
10. Questions and answers—October 31, 1985:
    Dr. Ralph Smuckler, dean, international studies, Michigan State University 973
    Thomas Stoel Esq., director, international program, Natural Resources Defense Council 977

AFRICA AND HUNGER: PROSPECTS FOR SUSTAINABLE DEVELOPMENT IN SUB-SAHARAN AFRICA

THURSDAY, SEPTEMBER 19, 1985

House of Representatives, Committee on Science and Technology, Subcommittee on Natural Resources, Agriculture Research and Environment,
Washington, DC.

The subcommittee met, pursuant to call, at 1:40 p.m., in room 2318, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Mr. Scheuer. The Subcommittee on Natural Resources, Agriculture Research and Environment will now come to order.

We begin today the first of a series of hearings on hunger in Africa. Of course, we are dealing with the heart-rending, pitiful, piteous, cataclysmic happening that we have seen there on our television screens in the last 6 or 8 months that is unparalleled in the annals of human civilization. Now, I don't think that is an exaggeration. I don't think I am letting my prose run away with my brain. I don't think that, other than the Holocaust, there has been a period in human history where so many people have suffered such devastating, heartbreaking, tragic suffering and death as we are witnessing in the last 6 months in Africa.

Despite the vast outpouring of aid, billions and billions of dollars of aid. From governments and from individuals all over the world, the starvation still continues to afflict this subcontinent and faces millions of people there now and in the future. Perhaps whenever a drought will be triggered to bring on the whole convergence of events that afflicts that poor benighted land.

So, as you have noted, if you have read our statement that is in the press release, we are going to be approaching this problem of hunger in Africa not from the simplistic point of view of simply giving aid but from the point of view of helping Africans make the decisions on every aspect of their development policies affecting food production, treatment of their natural resource space, considerations of population growth, and some of the programs that will inhibit population growth, not only family planning but basic changes in the role of women and the status of women that give women and young couples an incentive to restrict population growth.

So, we are dealing with a very challenging, a very interrelated, a very complex web of problems, a seamless web of problems. I think these 4 or 5 or 6 days, as it will turn out, should be a very productive set of hearings.

We are all aware that famine in Africa has exacted this horrendous human toll that we have talked about. In terms of geographical impact and human impact, it is unparalleled. From what I have seen on television, the emphasis on doing something to solve the current emergency brought on by the current confluence of events tends to deflect our focus from the long-term measures and the long-term public policy making that must be faced up to in order for the basic problems to be solved.

It is interesting to note that 20 years ago every single country in sub-Saharan Africa was a food exporter. Today every single country in sub-Saharan Africa is a food importer. Therein lies a very fascinating tale.

The question we have to address is, how do we help Africa in its future, develop its own leaders in a way that is consistent with its own mores, its own culture, its own religious and tribal beginnings. How do we help them achieve the ability to feed their population, to clothe them, to house them, to educate them, to health-care them, and to employ them in a kind and forgiving society in a land that is not very kind and not very forgiving and very unforgiving of basic mistakes? What can be done to ensure that future droughts will not lead to the kind of widespread famine that we are seing now?

These are the questions that we will be addressing over the next few months, addressing these basic questions, and the question of the prospect of long-term sustainable development in this continent. We will try and achieve a better understanding of the factors I have mentioned, of the interrelationship between climate, environment, population, and human activities of all kinds, food raising, the whole length and breadth of development activities, an understanding which is absolutely necessary if we are to identify effective long-term solutions.

For example, the simple premise that drought brought on the current famine in sub-Saharan Africa, a very wide-held premise, is a misconception. Drought was the trigger, not the cause, of the famine that we are seeing today in the entire sub-Saharan region. One of the underlying causes was the failure of the region's entire ecological system, which in turn was brought on by increasing demands of an explosion of humanity, too many people and too many animals trying to seek sustenance on too fragile an ecostructure. The result was that the ecostructure collapsed.

This is known as desertification, when arable land reverts to desert, when forests disappear, and the same sad tale of erosion, loss of cropland, loss of trees proceeds.

Our challenge is to break this cycle of a deteriorating natural resource base brought on by overexploitation, unwise overexploitation of the land for long periods of time. We can do this by providing the small-scale farmers in Africa with seeds, with plants, with animals, with appropriate technology that meets their needs, not the needs of agribusiness in the United States, for which our agricultural research industry is aimed. We have to have a whole new approach to agricultural research and environmental and ecological research designed to fit a whole new gestalt to produce sufficient food on a sustainable basis by respecting the environment and by controlling population growth.

Today the subcommittee begins its examination of this seamless web of issues by focusing on the element which sets the boundaries of Africa's potential, namely climate. Since 1968 rainfall in the Sahel has been declining. Now, whether this phenomenon is simply part of a naturally recurring cycle or instead reflects some fundamental change in weather phenomenon is obviously an issue of major importance. We expect to have interesting testimony on that subject today.

What kind of agriculture can be sustained in the long term will to a large degree depend on what kind of climatic conditions can be expected over the long term. Some scientists have already speculated that the persistance of drought may in part be caused by widespread deforestation and desertification. If this is true, then surely vast programs of replanting forests and replanting croplands takes on an additional urgency.

If rainfall amounts and timing are known, resources can be conserved, and the limited water supply can be used more efficiently and more cost effectively. Similarly, an improved capacity to predict drought would help provide the region with earlier warnings of a drought than would otherwise be possible, enabling regions to undertake efforts to mitigate the drought's effects.

The witnesses we will hear from today will discuss these issues and will help us understand what resources we have that may be brought to bear against this intellectually challenging set of problems.

Before commencing our hearing of the witnesses, I want to turn to my two distinguished colleagues for any comments they care to make. I would first recognize the distinguished ranking member of this subcommittee, the Honorable Claudine Schneider of Rhode Island.

Miss **Schneider**. Thank you, Mr. Chairman.

I would very much like to share my enthusiasm and also my appreciation for your agreeing to hold these hearings. Having recently returned from Africa, my purpose there was multifaceted; but as a representative of the United Nations Environment Program to the U.N. Conference on Women, I had the opportunity to look closely at the environmental status of Africa, and Kenya in particular. But it has occurred to me that we have some significant pressures as Congressmen and Congresswomen that we are dealing with in the future, not just with Africa but also with our budget deficit.

Part of my mission and purpose was to respond to my own constituents' concerns: Why do we keep giving foreign aid, and how much more foreign aid is necessary and why don't we take care of our own people first? Well, I think that it is quite simple for we Members of Congress to acknowledge the fact that, regardless of those kinds of messages from our constituents, we will continue to be generous and continue to assist those who are in need through our foreign aid programs.

My particular interest was to learn that our tax dollars were being as well spent as possible on behalf of our taxpayers but also to ensure that those people who are genuinely in need were receiving the kind of assistance that we can provide them, particularly we who are members of the Science and Technology Committee who are in a position of providing them with both information and technology, two areas that transfer seems to be unfortunately lagging behind and oftentimes inadequate.

As the chairman has already indicated, the purpose of these hearings is to look at the integrated difficulties that relate to the problems in Africa, everything from the pressures of population on the land, the pressures of the climate on the land, the environmental practices and agricultural practices, and also to look closely at the energy use which, too, in most of Africa relates to the trees, deforestation, desertification, and then ultimately famines. So, this cycle of activities, all more or less environmentally related, certainly puts us in a position here on this committee where we ought to be able to take some significant actions, hopefully, as rapidly as possible.

The fact that we have some new computer technology in the United States that will combine data from the U.S. polar orbitting satellite and from U.S. and local ground reports into a monthly analysis and prediction package on the rainfall in Africa, on the weather and the crop and the rangeland conditions, I think, is an important contribution that our country can make.

The hearings today, which will be focusing on climatic impact on the activities in Africa, are ones that I think appropriate to analyze at this time. It is interesting to note that, despite our enthusiasm for such a program, there are many other linkages that are necessary to ensure the effectiveness of our satellite programs and weather prediction proposals. And that includes appropriate training of foreign nationals in Africa. It also includes us having enough knowledge from ground base to provide us with the data that is necessary to integrate and to coming up with appropriate predictions.

So, I am looking forward to the list of—and I say without any other qualifications—expert witnesses that we have here today. All of you have come from different parts of the United States. I am looking forward to what I anticipate to be the solutions that this committee should be pursuing. I thank you for your presence here today. Especially, Mr. Chairman, I thank you for your enthusiastic support for pursuing these questions.

Mr. SCHEUER. Thank you for your statement.

Now we will hear from Congressman Paul Henry of the State of Michigan.

Mr. HENRY. Thank you, Mr. Chairman.

Mr. SCHEUER. He is a very active, involved, and contributing member of this subcommittee.

Mr. HENRY. You flatter me.

If I may just speak a little more personally rather than formally, my mother was born to missionary parents from West Africa. Years later, I went and spent 2 years on the African Continent as a Peace Corps volunteer, 1 year of which was in Ethiopia. So, obviously, it has been kind of a personal agony in following events in that country.

My district is home to the U.S. AID Administrator, Mr. McPherson. We have met many, many times over this issue. For any number of reasons, the largest Bread for the World chapter is in my congressional district. The largest crop bloc, both in terms of number of participants and moneys raised, is from my congressional district.

I think sometimes we tend to focus so much on the hopelessness of the situation and not consider the hope, and there is substantial hope. Most Americans would be shocked to be told that when we had the 1980 grain embargo with the Soviet Union that the major supplier of grain making it up to the Soviet Union immediately and ever since thereafter has been India, which is now a major exporter of grain. Most Americans are not aware of the fact that Bangladesh now for year after year after year is an exporter of grain. Most people would be shocked to know that many agronomists believe that, given the proper climate in Ethiopia, unless too much of its topsoil has been lost, the Ethiopian nation has theoretically the capacity to feed the entire continent of Africa.

While I welcome the focus on the technical problems, I would urge the chairman at some point to deal with the difficulty of the introduction of market economics given the political structure of the African Continent. Clearly this was the turning point in Asia. It required massive American aid in the sense that we literally had to buy—I shouldn't say buy off, because it connotes the wrong thing—to create. We had to give enough aid to the urban centers to allow the governments of these developing countries to take the risk of going into market incentive economics to allow agriculture to do what it could do in those countries.

Somalia, which has suffered not as grievously as Ethiopia but has suffered terribly under much of the same thing, is now almost self-sufficient despite not quite the same intensity of the climatic changes and social problems, in a 2- or 3-year period by shift to market economics. We have done that by encouraging the governments of those countries, assuring them of a supply of food adequate to prevent them from urban unrest because we put our money where our mouth is with assurances that technologies are there to make these countries self-sufficient.

I think it would be wrong at some point not to focus on some of the political problems but also much of the hope that is there, if we could interject some market economics and some very difficult political circumstances.

I thank the Chair.

Mr. SCHEUER. Thank you very much.

Let's have the panel come up to the witness table. Dr. Sharon Nicholson is from Florida State University. Dr. Eugene Rasmusson is from the Climate Analysis Center at NOAA, the National Oceanic and Atmospheric Administration. Dr. Joan Hock is Director of Assessment and Information Services Center of the National Environmental Satellite, Data, and Information Service. Dr. Jagadish Shukla is from the Department of Meteorology at the University of Maryland.

We are delighted that you are all here. Your statements will all be printed in toto at this point in the record. We hope that you will summarize your statements in about 5 or 6, not more than 7 minutes.

We will start out with Dr. Sharon Nicholson from Florida State University.

STATEMENTS OF DR. SHARON E. NICHOLSON, DEPARTMENT OF METEOROLOGY, FLORIDA STATE UNIVERSITY; DR. EUGENE M. RASMUSSON, CLIMATE ANALYSIS CENTER, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; DR. JOAN C. HOCK, DIRECTOR, ASSESSMENT AND INFORMATION SERVICES CENTER, NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE; AND DR. JAGADISH SHUKLA, DEPARTMENT OF METEOROLOGY, UNIVERSITY OF MARYLAND

Dr. NICHOLSON. Thank you, Mr. Chairman and members of the subcommittee. I would like to thank you first of all for the opportunity to address this group and also in particular for your interest in this matter, which has been a very serious one, which I think we have neglected all too long.

I will keep my remarks very brief. There are four points that I would like to make. These are expanded upon in my testimony. In doing so, I think this is best illustrated by showing you a couple of transparencies, if the machine is in working order; if it's not, the same things are in my testimony.

Show it on the wall over here.

First of all, I would like to point out the extent and magnitude of the drought situation. Here I am only illustrating what happened in the sub-Saharan border regions just south of the Sahara. This is the most extreme situation. You see rainfall in the 1950's versus rainfall in the last 15 to 20 years. It is no wonder that all of these countries have turned from exporting food to importing food. The change of rainfall has been about 50 percent.

We are talking about countries which in the 1950's had rainfall conditions of about 30 inches per year. This is similar to perhaps Indiana, certain areas of the Midwest. In this time period they might have had 12 to 15. This is much more similar to the arid Southwest of the United States. So, this is a very tremendous change of rainfall conditions.

Second is the extent. On a satellite photo I superimposed the area affected by drought in Africa. That is the shaded area including this dark region in the low latitudes. I have superimposed a picture of the United States. We are talking about the area which is three times the size of the continental United States. The area up here has suffered almost continuously since the early 1970's.

Now, to go back to a point raised earlier about, is this an African problem or does it affect us? Well, we simply don't know. When you consider an area of the globe as large as this, which has undergone such a tremendous change in rainfall, chances are it's going to have implications for the entire global atmospheric circulation.

More directly, the hurricanes that we receive in the Southeastern United States start up as little blips in the pressure field over Africa. How rapidly they develop depends in part, we believe, on what happens over the African Continent. So, at least one potential is there in terms of influencing the U.S. weather.

A few weeks ago, Miami was experiencing a dust outbreak from the Sahara. It is not correct to say it is merely African weather. There are certainly examples of how we could be affected as well.

Two other points: it is sometimes embarrassing to stand before a group of people and say, we as meteorologists cannot explain why the drought happened. It's true we cannot, but I would like to point one thing out in this context. Ten years ago, we knew—I may be exaggerating slightly to say—virtually nothing about meteorology in the tropics. Ten years ago, we began a number of international field experiments under the auspices of the Global Atmospheric Research Program. This has totally changed our understanding of the climate and weather situation over much of the globe but in particular the tropical regions. So, the point is we are only now at the point that we know enough to know the proper questions to ask to explain the African drought.

Finally, I would like to point out one major need among many. That is the need for obtaining more data. As others may tell you, in some cases we have less data now than we had 15 or 20 years ago. But there is a lot of data that does exist that needs to be archived. I say exist: existing in the African countries. We could help them to archive this data. There are a lot of other types of data that really require a major global or international effort.

One tool I would like to stress, if I have about 1 more minute, is the development of satellite imagery to help us assess the situation. At any given time in Africa, perhaps 10 percent of the countries are somehow affected by political unrest. You can't expect to continue a series of meteorological data in such situations. But we need continuous coverage.

Satellites can provide this, uninterrupted records. To show you how sensitive some of this is—this may not show up quite so well. But you can see by observing where the Sahara is. This is a vegetation index, which we hope is related to rainfall. You can see in the orange colors, this is the Sahara Desert. You can see in 1983, December over Kenya, you saw things looking like the desert.

This is the equatorial rain forest, the wettest region. The most lush vegetation cover. You see 1 year later, we don't have the met data for it but we have the satellite data. That same area of Kenya that looked like the desert a year earlier—oh, you can't see my pen. Kenya is over here. It looks like the equatorial rain forest. This is only one example, but I want to stress the use of satellite photos as one tool that can be used continuously in the absence of conventional data.

Thank you very much.

[The prepared statement of Dr. Nicholson follows:]

DROUGHT IN SUB-SAHARAN AFRICA

A Report Prepared For

The U.S. House of Representatives Committee on
Science and Technology

Subcommittee on Natural Resources, Agriculture
Research and Environment

by

Professor Sharon E. Nicholson
Department of Meteorology
The Florida State University

Three quarters of the African continent is predominantly semi-arid land which is inherently prone to drought. This fact has been dramatically observed during the last four years, during which only a small strip of equatorial rainforest and the hyperarid core of the Sahara desert have not experienced severe drought. The departures from normal rainfall (in percent) are shown for selected regions and years in Figs. 1 and 2. The drought in northern Africa has persisted throughout this time period with relatively little change in areal extent or severity. In southern and eastern Africa, although extensive areas have been affected in each of the four years, few regions suffered continually. In the semi-arid lands along the Sahara's southern border, dry conditions have now persisted since the late 1960's and have affected an area nearly twice the size of the continental United States (see Figs. 3 and 4). The rainfall of the most recent 15 years has been about half as great as the mean rainfall during the 1950's (Tab. 1).

The causes of African drought have not been well established. A few studies have documented unusual weather patterns which appear to be associated with drought. However, most studies which demonstrate a convincing relationship have focused only on one or two years or have failed to identify a definite cause and effect relationship. Nevertheless, on the basis of the available evidence the vast majority of meteorologists concur that the cause of the droughts can be traced to the large scale patterns of atmospheric circulation.

The last point is important, as it has often been said that the drought has been produced by human-induced environmental changes in Africa. This viewpoint has been fostered by the non-meteorologist and is usually based on the supposition that droughts of this extent and severity are a recent phenomenon. This hypothesis is belied by historical occurrences of droughts which were quite comparable to the present one. A good example is the period from about 1820 to 1840. Throughout these two decades (following a long decline in rainfall), drought affected most of Africa (see Fig. 5). In the Sahel and south of it the drought was so severe that Lake Chad was nearly totally desiccated. During the worst drought years of the early 1970's (see Fig . 3) most of the lake basin was filled; a state of desiccation comparable to the early nineteenth century was not reached until the early 1980's. Similarly, nearly half the population of Sahelian regions near Timbuktoo perished during a protracted drought from c. 1738 to 1756.

The influence of human activities is a tempting hypothesis when one observes the downward trend in rainfall which has occurred in Sahelian Africa since the early 1950's (see Fig. 3). This variation can also be interpreted in another manner, especially when the whole series of fluctuations since 1901 is examined. It appears that once a drought begins (e.g., in the 1910's or the late 1960's), it may persist for a decade or more. Similarly, once wet conditions are initiated (e.g., in 1950), they may also persist for about a decade. It is noteworthy that such persistence appears to be a unique feature of Sahelian Africa; elsewhere on the continent droughts tend to last one to three years and seldom longer. That is also the case throughout most of the world. This has led to the speculation that Sahelian droughts (or wetter conditions) may be self-reinforcing via feedback mechanisms related to changes in the land surface. This concept, first proposed by the late Prof. Jule Charney in 1974, is termed "biogeophysical feedback." The idea is that the conditions which initiated the drought might be reinforced by changes of the land surface which result from the drought: e.g., higher surface temperatures, higher reflectivity of the surface (albedo), lower soil moisture content, reduction of vegetation cover, increased dust content of the atmosphere.

These ideas have been repetitively tested by numerical models and the concept is beginning to receive general acceptance among those researching the problem of African drought. It should be pointed out that these changes of the land surface also result from such activities as overgrazing, overcultivation, erosion and deforestation, hence the potential exists that mankind might also contribute to this feedback loop, especially if such activities are continued and accelerated. At present, however, the most likely effect of large-scale anthropogenic deterioration of the African landscape is a different one. The effects of the drought may be exacerbated in that a higher proportion of the meagre rainfall is loss through evaporation and runoff when vegetation is removed and the fine topsoil and organic matter (which retain water) are eroded away.

Clearly, there are many unanswered questions about drought in Africa. One of the reasons for our lack of meteorological understanding of this phenomenon is the relatively sparse data base which exists for research. This problem was particularly acute prior to the massive data collection efforts beginning in 1974 under the auspices of the World Weather Watch Program (more recently termed GARP or Global Atmospheric Research Program). Our whole concept of the tropical atmosphere changed dramatically within a few years and thus we are only now beginning to understand the relevant questions to ask in order to identify the causes of drought in Africa.

Research has also been hindered by a lack of a readily available conventional data base with such basic information as temperature, rainfall and winds. Contrary to long standing belief, a large volume of observations do exist and are reasonably reliable but nearly inaccessible. For example, we now have an archive of over 1000 rainfall station records for Africa each covering about 50 years, but ten years of effort (mainly by one scientist) were required for the collection. The extraction of other types of data would be even more painstaking and would require the effort of a large number of individuals. At present, real-time acquisition of most data needed for research is virtually impossible (the notable exception: information derived by satellite). It must be stressed that every African country has a functioning meteorological service which maintains regular collection efforts at a large number of stations. The problem is 1) to archive this material in a usable format (preferably in a computer archive) and 2) to publish and disseminate this information. More often than not, these tasks cannot be supported by economically hard-pressed governments in the developing countries of Africa.

A final question related to African drought is its predictability; a number of grim forecasts have recently received media attention.

These are inevitably based on assumed continuation of some real or imaginery long-term trend or on supposedly observed cycles of drought; such predictions have no credibility. Trends only describe the past and climate and weather conditions tend to change abruptly, without warning. Similarly, even statistically derived "cycles" only indicate approximate frequencies at which events tend to repeat themselves and such cycles can dramatically change in length or disappear entirely. Moreover, the cyclic variation in rainfall is generally a very small fraction of the total variation of rainfall from year to year. Reliable predictions must be based on physical laws which describe the complex behavior of the atmosphere or on well-established spatial and temporal linkages between various parts of the global atmosphere. Unfortunately, for Africa our knowledge is not yet sufficiently advanced that we can make reliable forecasts beyond a few days.

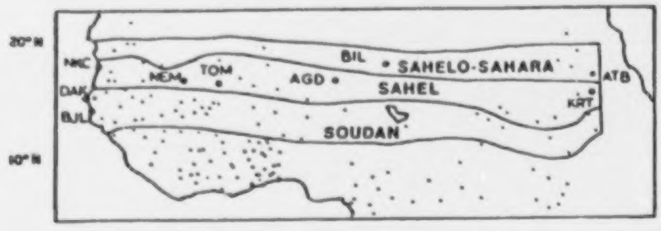
A few other observations are relevant here. The persistence of drought, or at least dry conditions, in the Sahel for nearly two decades does not necessarily signal a long-term climate change. The drought of the 1820's and 1830's gave way to conditions considerably wetter than modern ones within about two decades. Late in the century, wheat was grown in some riverine sectors of the West African Sahel, but this has not been possible since the 1890's, after which time a significant reduction in rainfall occurred. On the other hand, we also cannot rule out the possibility that the last two decades are part of a longer term trend, but no such change has been observed in the drought-stricken areas of southern Africa, where long-term rainfall fluctuations tend to be similar to those in Sahelian Africa.

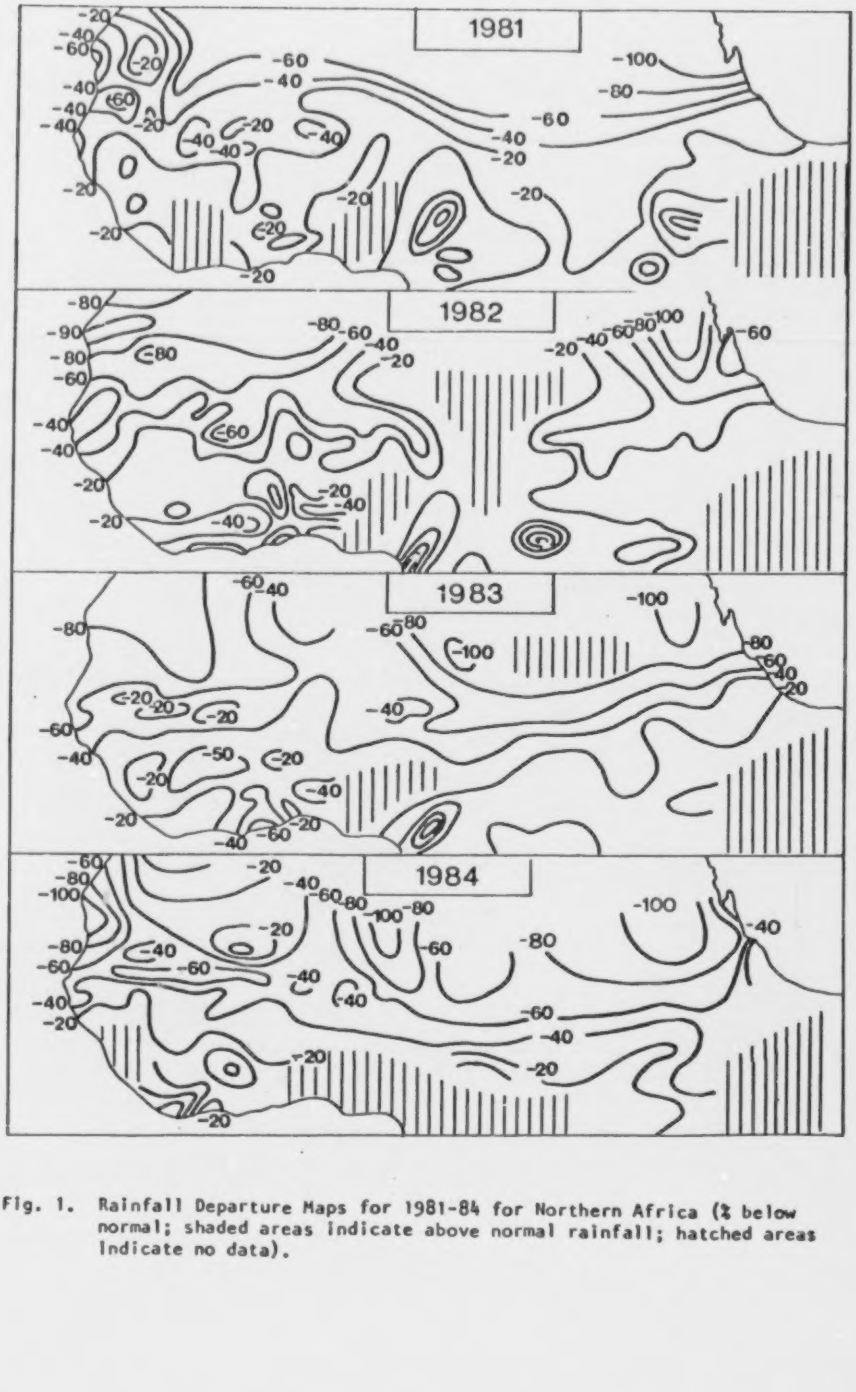
A number of pressing research needs concerning African climate are evident. One is merely a better understanding of the individual weather systems producing rainfall in Africa. Only in light of this can we begin to identify the mechanisms of rainfall variability, short- or long-term. Secondly, the teleconnections (long distance linkages) between African climate patterns and global weather (including the el Nino phenomenon) must be identified and physically explained. Similar linkages with the oceans must also be investigated, as must be possible mechanisms of feedback between the land-surface and the atmosphere. Research into the application of meteorological knowledge to agricultural production might help to minimize the impact of drought. All of these research tasks require increased effort in establishing a data base, including both ground-based and satellite observations.

TABLE 2. Rainfall (mm) at nine stations in 1950, 1972 and 1983 and for the periods 1950–59 and 1970–84. (See below for station location.)

	Year			Period (mean)	
Station	1950	1972	1983	1950–59	1970–84
Bilma	40	21	0	20	9
Atbara	166	55	15	92	54
Nouakchott	183	103	66	172	51
Khartoum*	178	135	86	178	116
Agadez	262	74	94	210	97
Tombouctoo	230	106	74	241	147
Nema	345	245	43	381	210
Dakar	797	130	159	609	308
Benjul	1489	583	358	1409	791

* At Khartoum, only 15 mm fell during the July–August–September 1983 rainy season.




1981
-20
-40
-60
-20
-40
-60
-40
-40
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-40
-20
-40
-40
-60
-40
-20
-20
-20
-20
-20
-100
-80
-60
-40
-20
-20
1982
-80
-90
-80
-80
-60
-40
-40
-60
-20
-20
-40
-20
-40
-80
-60
-40
-20
-20
-40
-60
-80
-100
-60
1983
-60
-40
-80
-60
-80
-100
-100
-80
-60
-40
-20
-20
-20
-20
-40
-60
-40
-50
-20
-20
-40
-20
-40
-60
-20
1984
-60
-80
-100
-20
-40
-60
-80
-100
-80
-20
-60
-100
-40
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-20

Fig. 1. Rainfall Departure Maps for 1981-84 for Northern Africa (% below normal; shaded areas indicate above normal rainfall; hatched areas indicate no data).

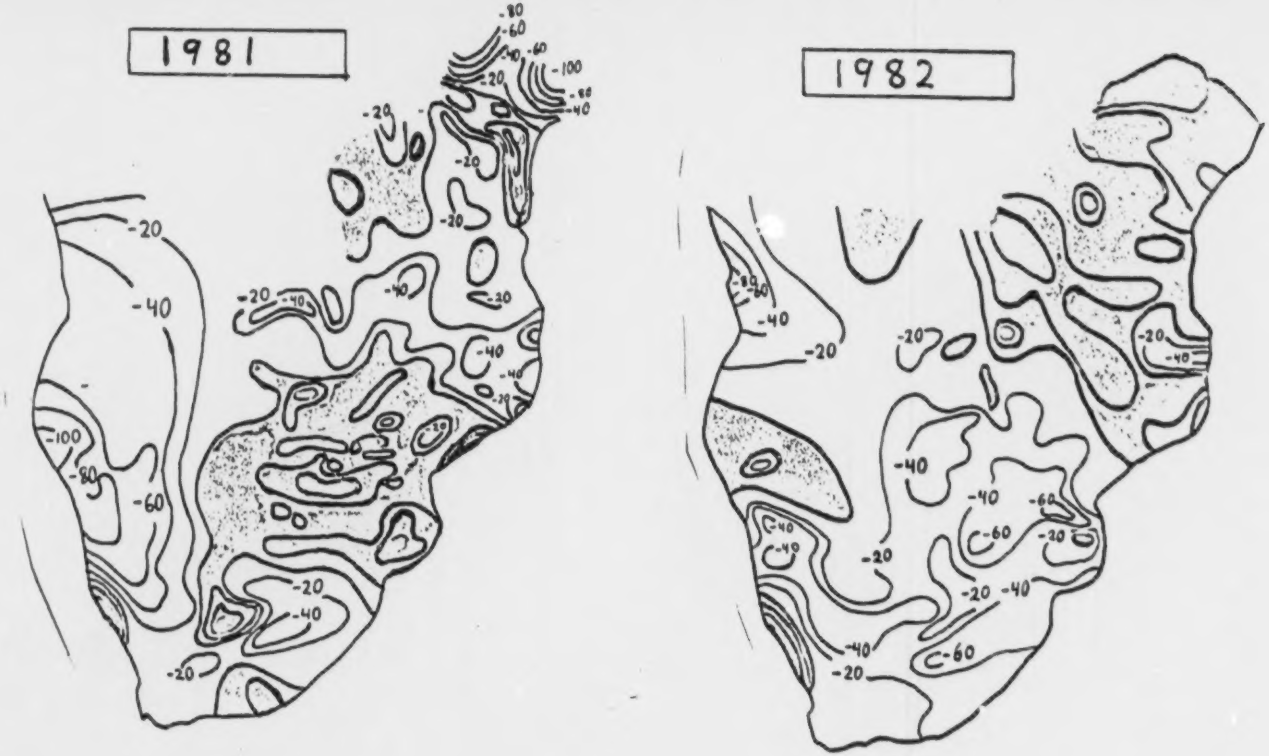

1981
1982
-20
-40
-60
-80
-100

Fig. 2a. Rainfall Departures from Normal (in %) for Southern and Eastern Africa (shaded areas indicate above normal rainfall, in increments of 20% above normal)

Fig. 2b. Rainfall Departures from Normal (in %) for Eastern Africa in 1983 (shaded areas indicate above normal rainfall, in increments of 20% above normal)

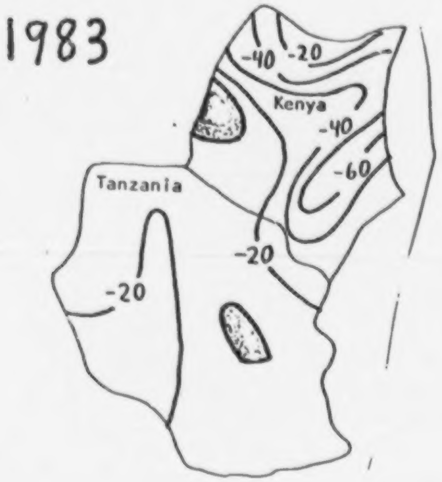
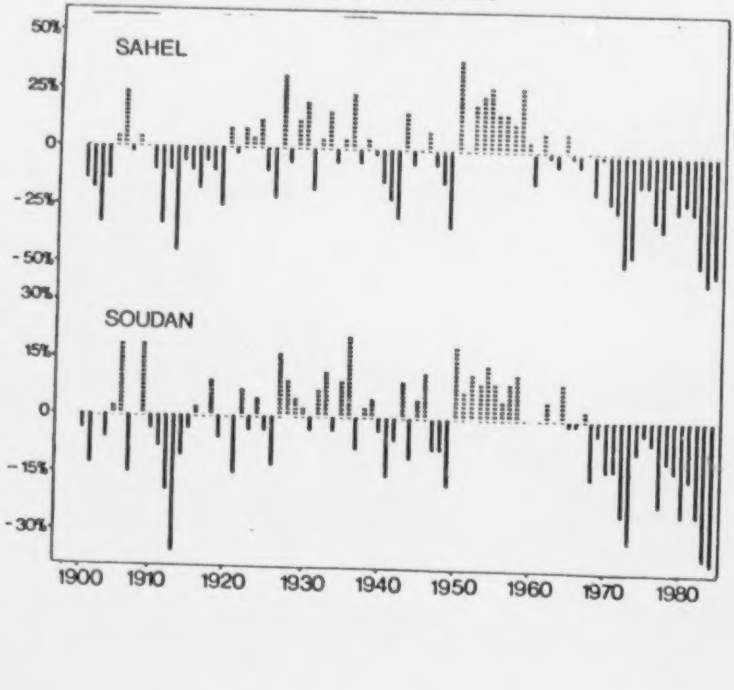

1983
Kenya
Tanzania
-40
-20
-40
-60
-20
-20

Fig.3 : RAINFALL FLUCTUATIONS 1901-1984
(% above or below the mean)



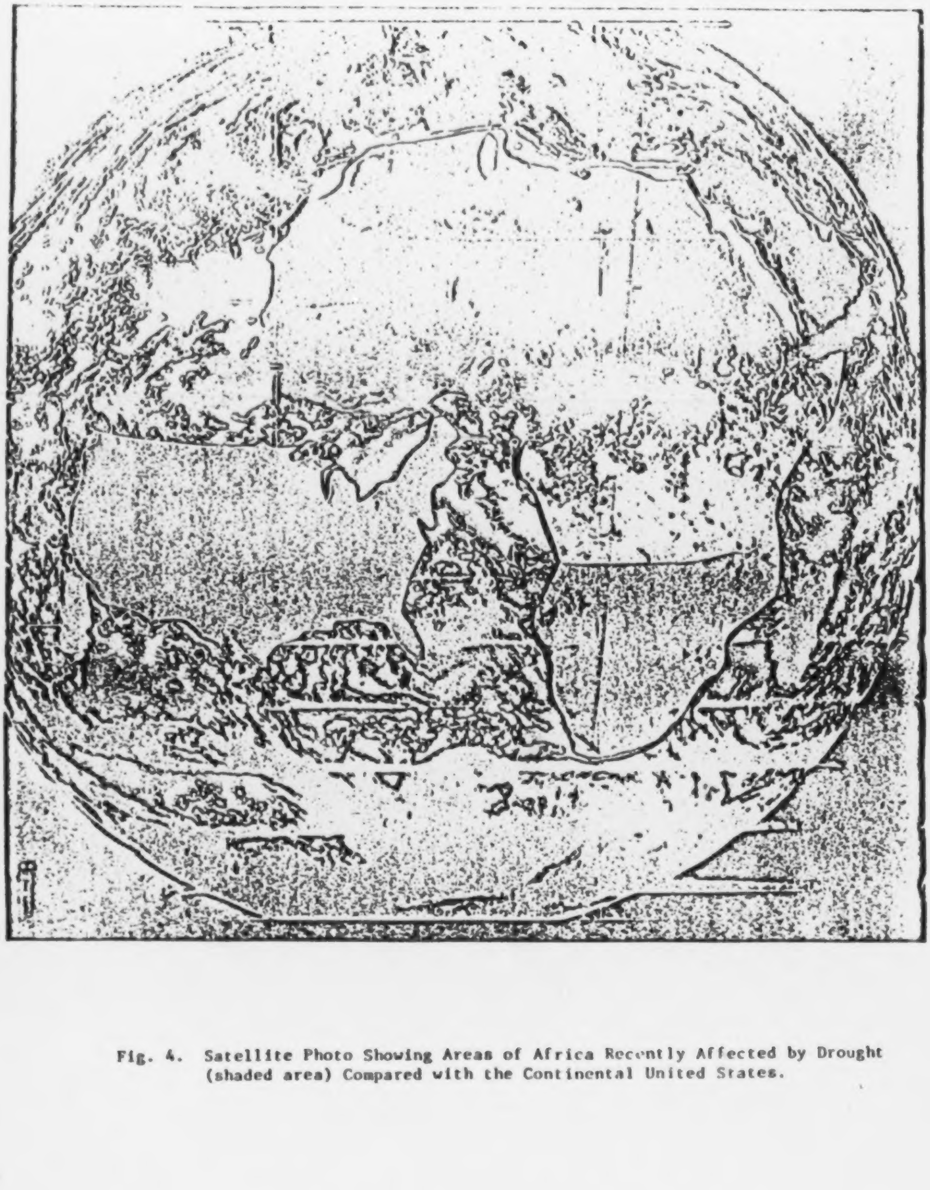


Fig. 4. Satellite Photo Showing Areas of Africa Recently Affected by Drought (shaded area) Compared with the Continental United States.

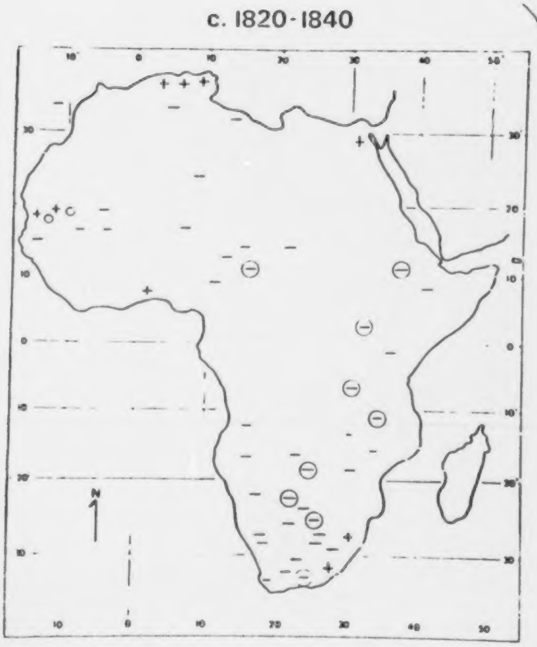

c. 1820-1840
N

Fig. 5. Areas Affected by Drought throughout Most of the Period 1820-1840.

Mr. **Scheuer**. Thank you very much, Dr. Nicholson.

Now we will hear from Dr. Eugene Rasmusson.

Dr. **Rasmusson**. Thank you, Mr. Chairman and members of the subcommittee.

I was asked to speak on causes of both year-to-year and long-term variations in rainfall in sub-Saharan Africa and, in addition, to address the need for an integrated research plan aimed at predicting these variations. If you recall the first transparency that Dr. Nicholson showed indicating the changes in variation from year to year in rainfall, you noticed intense dry periods maybe lasting 2 or 3 years, but superimposed on that the long-term down trend that has been occurring over the last 3 decades. This was in the Sahel. If you go further south into other areas of Africa, you see primarily just the short intense dry periods. This, of course, is what distinguishes the Sahel-Soudan region from the rest of Africa—that long-term down trend. So, in addressing this, we look at two time scales of variation, the long-term down trend and these intense dry episodes.

So far as causes, in terms of the short-term variability, we have some very enticing clues, which appear to be very much associated with these events. These, again, are things that have been uncovered in about the last 10 years. Basically, what we have to do is look beyond the atmosphere. The atmosphere is about as far as you have to go for day-to-day weather forecasting. The scale in the forecasting is largely contained in the atmosphere as it exists at the beginning of the period. But when we get out to time scales as long as months or years, we have to look at other parts of the climate system which retain more of the memory, that are more slowly changing. Here we look at the oceans and possibly the land surface.

The last decade or so has had great advances in identifying the tropical oceans as one of the very key areas of variability. The linking of the atmosphere and the atmospheric variability with the tropical oceans as one system apparently accounts for a great deal of the variability in the tropics on time scales that we are interested in on these short periods and in a good deal of variability in the extra-tropics, that is, in the temperate latitudes as well.

So, this is the clue that I think in a research program we would want to adopt as our basic hypothesis. No. 1, the key to the problem probably lies in variations in the slowly varying surface conditions. We have a clear demonstration that the ocean is involved, particularly the tropical ocean. And we have clues that possibly the land surface is involved—this is something that needs to be resolved. I am sure you realize, as Congressman Scheuer pointed out, that this will affect policy decisions. This, of course, has to be a major thrust of a research program, in my mind, that we resolve that question.

Now, the research program itself—I should, before I get to that, mention the long-term trend. Here we have a real problem because the processes that are associated with that long-term down trend in the Sahel are not at all clear. We have some links with the large scale, again, with the global. There is some indication, it has been found by some British investigators, that this is associated with a sea surface temperature change again in the tropics, around the entire global belt. But also it invites speculation as to the possibility this is involved with the environmental degradation that has been going on, the demonstrated deforestation and desertification—again a very important issue to be resolved in a research program.

It cannot be resolved, in my estimation, from data alone. It is going to have to be a mix between data, more and better than we have now and experiments with the big numerical models that have come again so far in the last 10 or 15 years.

I might go back and just briefly remind you that we had the intense drought in the early 1970's. It came and went. We now have again an even more intense drought in the early 1980's. We are now in a better position—the model development has come a long way in that time. The understanding of the processes has come a long way.

So, in a wrap-up so far as the causes, we are faced with what looks like a relationship with global climate changes, particularly in the tropical oceans, and some clues, some suspicion that the local land surface may also be involved.

Now, I should say with regard to the current status of the research effort, there is research going on, but it at this time lacks a focus. It is going on in various contexts. It lacks a plan and lacks priorities. The National Climate Program Office is planning to produce a report produced by experts on both the research and the operational sides to attempt to set priorities and lay out a rational plan for attacking this problem.

A research program, I would submit, ought to involve the question of determining how it is that a sea surface temperature fluctuation such as, for example, over the Pacific, which is indeed related to climate variability and rainfall variability over some parts of Africa. The El Nino/Southern Oscillation phenomenon, for example, which is associated with warming of temperatures in the Pacific, affects parts of Africa. How in the world this has happened a half a world away? And if it does, how does it affect the circulation over Africa? And does that in turn affect the precipitation regime?

We run into a big problem here because the data over Africa, particularly the upper air data and the meteorological data needed for this type of research, is in very sad shape. The Africa infrastructure of their meteorological services has not progressed after World War II. In fact, it may have gone downhill.

The big system at the World Meteorological Organization that ties together all the national meteorological services is called the World Weather Watch. This is the system that ties together the observational, the data transmission, the forecasting systems. This is in very poor shape over Africa and needs development, in my judgment.

The United States supports this through the voluntary cooperation program. This is administered by the World Meteorological Organization. In this country our contribution is administered by the National Weather Service. This is the means by which we provide support in the way of meteorological stations, expendables, and training for the African nations.

The International Research Program is moving along very fast. It is rather surprising how fast some of the nations are responding to this. The United States, I think, need to get their position clear in regard to that. We do have two international programs already in existence in which the United States is playing a very major role, that are addressing certain aspects of this. One is the program called the Interannual Variability of the Tropical Ocean and Global Atmosphere, or the acronym TOGA, which you may have heard of. That is aimed at understanding how the tropical oceans affect the atmospheric circulation. From what I said earlier, it's quite apparent that that would apply to Africa.

The other one is a program called the International Satellite Land-Surface Climatology Project. That has an even worse acronym, ISLSCP. That is aimed at developing techniques from satellite data to monitor the surface conditions. You saw a very beautiful example that Dr. Nicholson put up, in terms of the vegetation index. That program intersects certain aspects of an African program. So, those are two international programs that are already under way.

I might just in closing say that there ought to be and certainly would be a great deal of fallout, in my estimation, from a drought program with an African focus. I grew up in Kansas during the 1930's. I remember the Dust Bowl very vividly. We still, I think it's fair to say, don't quite understand what produced it and what made it go away. The problem of drought is a major problem in large areas of the world. The understanding of drought processes, monitoring and early warning and prediction, that would come out of a focus on Africa, which is the big signal right now, would certainly have, I think, application for other areas.

Thank you.

[The prepared statement of Dr. Rasmusson follows:]

STATEMENT OF
EUGENE M. RASMUSSON
BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE
RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES
September 19, 1985

Mr. Chairman, and Members of the Subcommittee:

I am pleased to have this opportunity to provide information on the climatological aspects of African drought. I will attempt to summarize the major aspects of African drought, their relationship to global climate fluctuations and the nature of the research required to understand, and if feasible, to forecast at least some aspects of this phenomenon.

Most of the African continent consists of arid and semi-arid regions where year-to-year variability and long-term trends in rainfall are relatively large. The semi-arid regions of sub-Sahara Africa cover a huge crescent-shaped area, extending eastward in a narrow band from Senegal/Mauritania to the Red Sea (Sahel-Soudan Zone), then southward through Ethiopia and Somalia and southwestward around the Kalahari and Namib Deserts (see enclosed Figure 1). Large year-to-year rainfall fluctuations, typically 20%-30% of the annual mean, are common in this semi-arid crescent.

Worldwide attention was first drawn to the problem of African drought and famine during the catastrophic Sahel/Ethiopian drought of the early 1970's. With the easing of conditions in the mid 1970's both public consciousness and scientific interest waned. Yet Sahelian rainfall never returned to "normal" during the remainder of the 1970's. Severe drought again returned during 1982-84, this time enveloping a far larger region that included almost the entire semi-arid crescent. The coincidence of drought over such a vast region was the result of complex climatic processes which are inadequately measured, difficult to describe, and poorly understood. Some aspects of the problem are beginning to be untangled, but a comprehensive understanding of the basic causes of widespread African drought still eludes us.

The characteristics of African rainfall variability have been extensively documented by Prof. Sharon Nicholson of Florida State University. These studies suggest that the major aspects of African drought can be broadly characterized by viewing the phenomenon on two time scales: (1) widespread very severe drought "episodes", usually lasting for one-three years, and (2) long lasting regimes of chronically subnormal rainfall spanning a decade or more, which may include one or more intense dry episodes, with intervening years of only moderate drought. Both time-scales appear in most African rainfall records. The short term, episodic pattern is the dominant feature in the semi-arid regions of equatorial and southern Africa. The Sahel-Soudan zones just south of the Sahara are dominated by the longer time scale regime (see enclosed Figure 2).

Climate fluctuations extending over periods of weeks to seasons can be viewed as arising from two sources. First of all, they may simply arise from natural internal atmospheric variability. Theoretical considerations indicate that this source of variability, associated with day-to-day weather changes, is essentially unpredictable beyond a limit on the order of a few weeks. Secondly, anomalous (abnormal) lower boundary conditions (sea surface temperature, land moisture availability, vegetative cover, etc.) also lead to variability in monthly-seasonal averaged conditions. These surface anomalies usually evolve more slowly, often over periods of months or more. Thus, they represent a potentially important "memory" mechanism influencing the average conditions over periods of a season or more.

Observational studies together with ocean and atmospheric numerical model experiments have led to a growing awareness that a significant share - and in the tropics, a major share - of the atmospheric variability on time-scales of months to a few years is associated with tropical sea surface temperature variations that reflect large-scale interactions between the tropical ocean and the global atmosphere. The most important and pervasive anomaly patterns are linked to the global El Niño/Southern Oscillation (ENSO) phenomenon, which is related to the appearance of above normal sea surface temperatures in the equatorial Pacific. ENSO occurs at irregular intervals of 2-7 years and is associated with major dislocations of the rainfall regimes of the tropics, bringing drought to productive agricultural areas and torrential rains to otherwise arid regions. The relatively long time scale of this phenomenon (one-two years), together with the remarkably systematic form and sequence of the regional climate anomalies that appear during the lifetime of an ENSO episode, reflect an inherent degree of predictability.

There is clear evidence that the so-called ENSO phenomenon exerts an influence on year-to-year rainfall variability over large portions of

Southern Hemisphere Africa. The effect appears particularly strong over southeastern Africa, where the probability of subnormal rainfall is significantly enhanced during ENSO episodes. North of the equator, the effects of Pacific sea surface temperatures fluctuations appear to be much weaker. Over West Africa, year-to-year rainfall variability appears to be more closely related to sea surface temperature fluctuations over the tropical Atlantic, although it is still not clear whether Atlantic sea surface temperature is a causal factor or whether both it and West African rainfall are responding to other forcing factors. What is clear is that on the year-to-year time scale, the pattern of large-scale African rainfall anomalies can often be related to tropical sea surface temperature and to global rather than simply local patterns of climate variability.

The strong tendency for persistence of drought conditions over the Sahel invites speculation as to the possibility of a natural feedback between the local land surface conditions and the atmosphere, so that, once established, the dry conditions at the surface operate to reinforce the drought sustaining atmospheric circulation. Although a consensus on the importance of such land-surface feedback processes is yet to emerge, atmospheric model experiments clearly suggest the possibility.

The previous discussion relates to year-to-year variability. The processes associated with the three-decade downturn in Sahelian rainfall are unclear. The above normal regime of the early 1950's and the subsequent downward trend through the 1960's is reflected in similar but less pronounced trends over much of Africa, as well as China and India. This fact, together with a recent finding that the downward trend is also associated with a persistent global-scale pattern of tropical sea surface temperature anomalies, again indicates a link with global climate fluctuations.

In summary, African drought reflects the effect of complex climate processes operating on a variety of time and space scales. The relative importance of global and regional influences, both natural and man-made, is yet to be untangled. The National Climate Program Office (NCPO) is making plans for the preparation of a report on research priorities by experts representing both research and operational sides of the problem. The scope and complexity of the problem requires a careful separation of the research effort into a number of individual, more tractable components. It again seems reasonable to address separately the problem of intense drought episodes such as those that occurred during 1972 and 1982-84, and the problem of longer term variations, particularly as it relates to the future course of the long-term downturn in Sahelian rainfall.

Considering first the problem of short term variability, the evidence previously summarized seems to me to warrant a working hypothesis that interactions of the atmosphere with the underlying ocean, particularly in the tropics, perhaps amplified by interactions with the underlying land surface, is a major source of these fluctuations. A logical early goal of the research is the comprehensive documentation of statistical relationships between slowly varying ocean and atmospheric anomalies and African rainfall fluctuations. For the longer term, diagnostic studies will improve our understanding of the "teleconnection" processes by which a remote sea surface temperature anomaly affects the atmospheric circulation over Africa, and the processes by which these circulation changes modify the large-scale African rainfall regime. The scope of such investigations is at present severely limited because of lack of adequate surface and upper air data over Africa.

The international exchange of meteorological data takes place under the World Meteorological Organization (WMO) World Weather Watch (WWW) Program. This program consists of the network that ties all meteorological agencies throughout the world together for the purpose of data acquisition, telecommunications and data exchange. The U.S. supports the development of the meteorological services in those developing countries where the drought has been particularly severe, through the Voluntary Cooperation Program (VCP), administered through WMO. The VCP is vital not only for the development of those services in the developing countries, but also for insuring the availability of global data for preparing medium and long range forecasts for the U.S. Other U.S. assistance programs, such as those of USAID could also contribute to these benefits.

African meteorological data are also essential for use with Atmospheric General Circulation Models (GCM's) which will be an invaluable theoretical aid in the study of the drought processes. These numerical models are based on the mathematical representation of the physical laws governing large-scale atmospheric motions, as well as the physics of the atmosphere's boundaries. The GCM's are more complete and elaborate versions of models used in day-to-day weather forecasting and are integrated, using large computers, for much longer periods. Such models have been experimentally coupled in an interactive manner with the earth's hydrologic cycle and other land-surface conditions, and are now being coupled with companion oceanic GCM's in further experiments.

While it will likely be many years before coupled ocean-land surface-atmosphere GCM's evolve from a purely research tool to regular use in seasonal climate prediction, they offer the potential for further advances in scope, accuracy, and the setting of probabilities in seasonal climate prediction.

Although the limits of seasonal predictability have yet to be rigorously defined, and the degree to which this potential will be realized is unclear, early results encourage our efforts.

There are strong indications of a growing international commitment to the problem of African drought and therefore the need for the U.S. to be able to contribute in an effective and meaningful way. To do this the U.S. must assess its own capabilities and determine how best to coordinate with other countries and international agencies. Scientific questions and data problems similar to those just described are already being addressed by two closely allied international programs, conducted under the umbrella of the World Climate Program (World Meteorological Organization, United Nations Environment Program, International Council of Scientific Unions) in which the U.S. is a major participant. The first of these, "Interannual Variability of the Tropical Ocean and Global Atmosphere", known by its acronym, TOGA, is a ten-year program which began this year. Its objectives are to increase understanding of the variations of the tropical ocean and global atmosphere on time scales of months to years, to model the coupled ocean-atmosphere system and to provide a scientific basis for designing a practical system for prediction on these time scales, if models indicate that prediction is indeed feasible. The program is organized around individual ocean basins, with U.S. priority given to the tropical Pacific and the ENSO phenomenon. An African drought research element within this context would focus on the African response to sea-air interactions over the entire tropics.

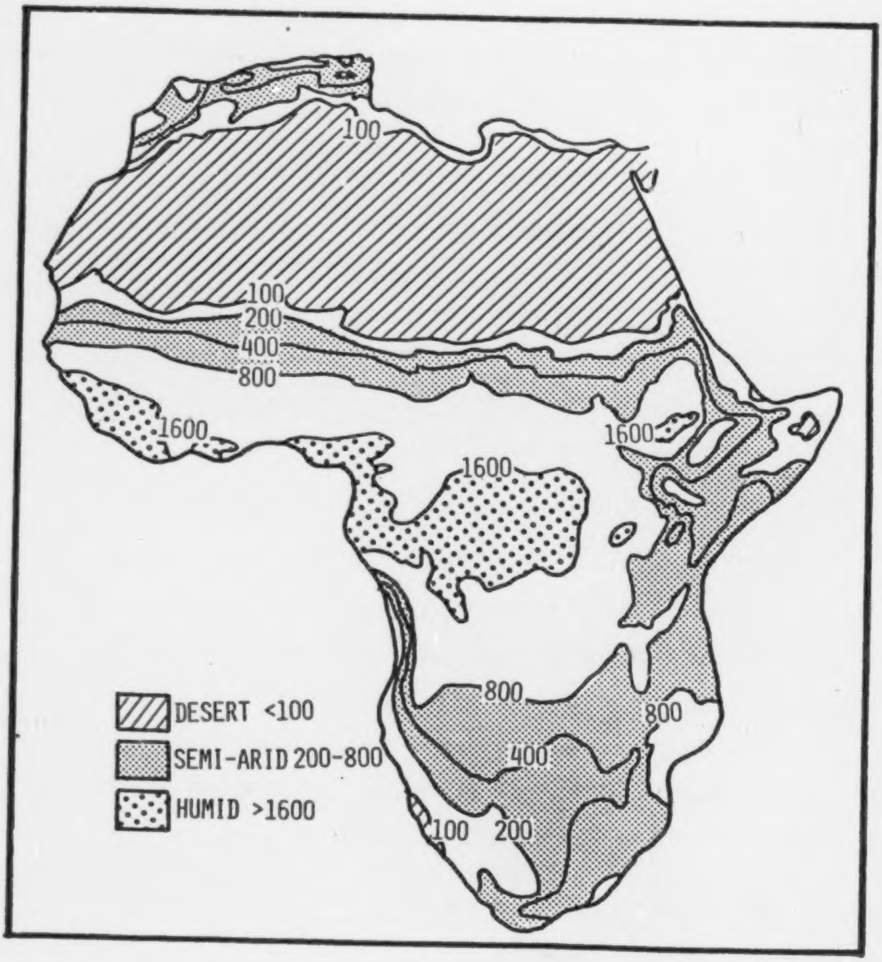
The second related program is the International Satellite Land-Surface Climatology Project (ISLSCP). Its purpose is to develop techniques for exploiting currently available satellite observations to determine land surface parameters e.g. surface temperature, radiation budget, vegetation, moisture availability. Availability of such observations will allow the monitoring of natural and man-made changes in land surface conditions. One such product, a vegetation index derived from NOAA operational Advanced Very High Resolution Radiometer (AVHRR) data has already provided unique and valuable information on vegatation changes over the Sahel between 1981-85.

Attaining an understanding of the long-term variation in Sahelian rainfall appears to be a formidable task, since there is little understanding of the basic processes involved. A crucial issue to be resolved is the degree to which environmental degradation - deforestation and desertification - has contributed to the downturn. In projecting these longer time scale changes the possible effects of changes in atmospheric aerosol concentrations due to man-made contamination must be given due consideration.

Recurrent drought is a serious problem for vast regions of the world. Our own Great Plains have witnessed severe, widespread drought episodes every few decades (the most recent during the mid 1950's and the dust bowl era of the 1930's) and will surely experience similar episodes in the future. Drought research with an African focus will have broad application (e.g. global satellite data products, theoretical, model and prediction developments) to the problem of drought in general.

Drought conditions have eased over most of the semi-arid region of Africa during the past nine months.

Figure 1. Climatological mean annual rainfall (millimeters) over Africa (adapted from S. Nicholson, 1981). Note the shaded semi-arid zone, where rainfall ranges between 200-800 millimeters (8-31 inches).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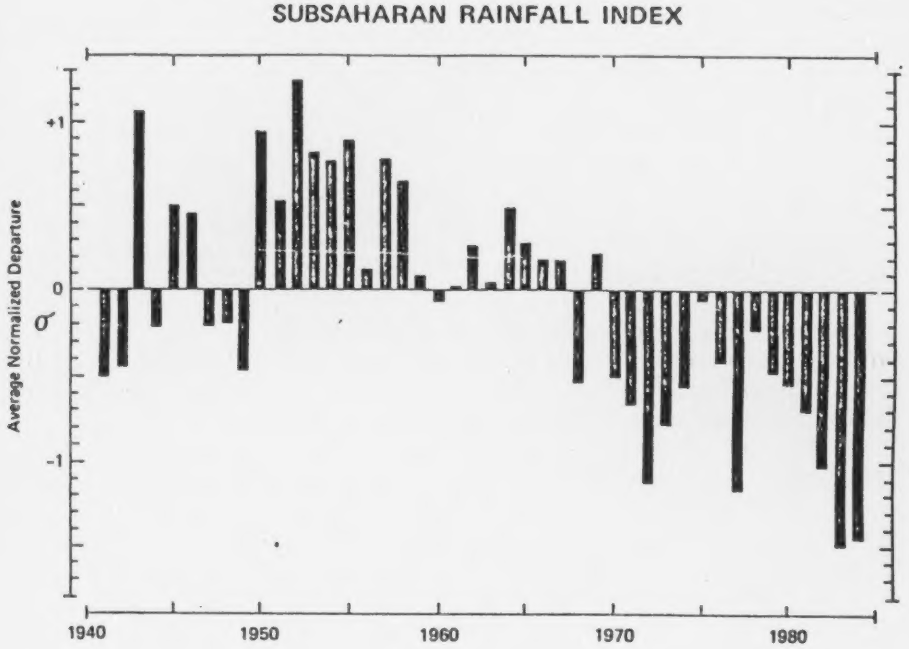


Figure 2. A rainfall index computed by averaging rainfall departures for 20 sub-Sahara stations in West Africa (from P. Lamb, 1985). Note the dramatic downturn in rainfall from the mid 1950's to the present.

Mr. SCHEUER. Thank you very, very much, Dr. Rasmusson.

Now we will hear from Dr. Joan Hock, Director of the Assessment and Information Services Center at the National Environmental Satellite, Data, and Information Service.

Dr. HOCK. Thank you very much for this opportunity today to give you a brief overview of the NOAA Program. I would like to give you some background on the program. We started in 1979. The program has been funded by the Agency for International Development. It is really a partnership to look at drought problems in the tropics using state-of-the-art technology. AVHRR imagery from the NOAA meteorological satellite is one of the key elements of the program.

But really the thrust of our work is multidisciplinary, because I believe that drought problems are really multidisciplinary problems. They need the insight and the talent of meteorologists as well as economists as well as satellite engineers.

As I said, the products that we are providing are a series of cables that we send out to the AID missions on a weekly basis. We have moved from primarily qualitative assessments that relied predominantly on rainfall data, ground station data, to a series of maps and graphics using the AVHRR imagery, which can assess not only subsistence vegetation but grazeland conditions. This is very important when you have countries like Niger and Mali that are engaging large segments of the population in herding. They are nomadic. You need a comprehensive assessment capability.

These assessment reports go to all eight of the Sahelian countries. They are going primarily to the AID mission offices right now. We are also sending cables that are quantitative assessments of current agricultural conditions.

Like Sharon's comments, I would reiterate the growth in terms of the new technology. A year ago, 2 years ago, we had basically a qualitative assessment capability. We were using ground station meteorological data. We were trying to calculate basically a crop yield index relying on 30 years of meteorological data. But we didn't have the monitoring capability. It has only been through the use of the meteorological satellites that we have been able to monitor ground conditions using the AVHRR imagery.

There are two aspects of our program. One is the provision of assessments, which are the report and the cables. The second part is technology transfer. I was very pleased to hear some positive comments about technology transfer. When I was at FAO recently, talking with Millicent Fenwick, the one comment she made was that we really should be doing more in the area of technology transfer and exchange, in terms of working with meteorologists and ag economists in these countries. It is not good enough to just send a cable over and say there's a problem. You want to develop a capability that these meteorologists in the respective countries can use this talent and this methodology for assessing their own concerns and use it in a leadtime way.

As an economist, I really think that leadtime is a very important aspect in terms of dealing with food shortages. We can provide a capability of something like 30 to 60 days before harvest, assessing the magnitude of a drought. You won't see price changes frequently for 1 year after that drought has occurred. So, with these new technologies we really have——

Mr. SCHEUER. Would you please pull the mike over and pull it closer to you and speak right into it? I am having a lot of trouble hearing you. I'm sorry.

Dr. HOCK. As I was saying, with these new technologies there really is a capability for leadtime planning in these countries.

So, that is in essence my comments in terms of NOAA's program. In summary, it has been made possible by the Office of Foreign Disaster Assistance. We are using the National Weather Service data, the WMO information, as well as the satellite information from both the meteorological satellite and Meteosat. I really think that there is a tremendous potential here in terms of addressing food shortage problems both now and in the future.

One other comment I would like to make before closing, there has been a lot of comment on, did our assessments make a difference? And one of the really rewarding aspects of my job is to see some of the cables that come back from these various missions. In Mali, for instance, our work provided the country the capability of doubling their food request, because they had a better assessment of the shortfall. This was 1 year ago. We are getting very positive response in Ethiopia on our work.

So, there really is a very strong support in terms of the field in the validity and in the quality of the assessments that we are producing.

Thank you.

[The prepared statement of Dr. Hock follows:]

STATEMENT OF DR. JOAN C. HOCK
DIRECTOR, ASSESSMENT AND INFORMATION SERVICES CENTER
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U. S. DEPARTMENT OF COMMERCE
BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

September 19, 1985

Mr. Chairman and Members of the Subcommittee:

We appreciate this opportunity to provide information on NOAA's Operational Drought/Disaster Early Warning Program for the Sub-Saharan African Region. This program, which was developed with the support and funding of the AID Office of U.S. Foreign Disaster Assistance, is based on climatic impact assessment technology. My remarks focus on the use of assessment technology as a reliable, timely, yet cost-effective tool for drought/disaster monitoring and technical assistance in Africa. Our operational monitoring system will be described and it will be shown how NOAA's current assessments contribute to improved early warning and quantitative determination of food shortage needs. As Director of the NOAA/NESDIS Assessment and Information Services Center (AISC), I will specifically focus on past and ongoing operational support that we have provided to AID including USAID Missions and American Embassies, USDA, other U.S. Government agencies, international organizations and participating developing countries.

Beginning in July 1985, AISC's routine assessment reports for the African Sahel and Horn countries were significantly expanded and upgraded under a recent agreement between NOAA and AID. The purpose of this new program is to accelerate the rehabilitation and disaster recovery process associated with the African drought/famine emergency. AISC is currently providing detailed quantitative Special Climatic Impact Assessments to USG agencies, USAID Missions and host-countries (the eight Sahel countries plus Sudan, Ethiopia and Somalia). The program is designed to significantly improve the capability of the host-countries for operationally assessing the impact of weather on agriculture (food crops and rangelands) and for using these assessments as timely, reliable, quantitative inputs to agricultural crop forecasting, agricultural policymaking, rangeland management and drought/famine forecasting and relief planning. In this context, AISC prepares special assessments and is tasked to assist USG and host-country officials in the interpretation and use of the assessments.

Before I discuss the details of this new assessment program, I would like to describe how it evolved. AISC's current African assessments build on eight years of project work with AID, recent developments in the use of NOAA meteorological satellite data for climatic impact assessment and AISC's Special Assessments on the 1984 Africa drought.

Since 1977, AISC and the AID Office of U.S. Foreign Disaster Assistance (OFDA) have cooperated to improve early warning of drought disasters and to meet OFDA's technical assistance objectives on disaster preparedness in the developing world. Since 1979, AISC has issued weekly and monthly assessments of climate and weather impact on food security in developing countries within Africa, Caribbean Basin, South and Southeast Asia, and more recently, Central America, the Andean countries of South America and the Southwest Pacific Island Groups. These qualitative assessment reports, based mainly on rainfall data, are sent by cable to U. S. Missions in approximately 80 countries. They are designed to provide American Embassies, USAID Missions and USG agencies with current information on drought conditions, its impact on subsistence crops and an early warning alert on the potential for drought induced food shortages. Studies have shown that climate impact assessments issued 30 days before crop harvesting begins can provide at least a 3 to 6 month lead time to decision makers, planners and economists who must develop food assistance strategies and measures to mitigate potential socio-economic disruption. Because of the reliability and value of these assessments, AISC has been asked by AID/OFDA to assist interested developing countries implement their own national operational assessment programs. Since 1980, approximately 30 developing countries have received AISC technical assistance including the eight Sahelian countries.

Thus, these qualitative assessments were designed to identify potential drought problems through continuous monitoring and to provide sufficient early warning so that follow-up actions, including on-site verification, could be taken. Prior to 1977, U.S. Missions generally did not have access to USG assessment services. Furthermore, weather data resources in developing countries were not being fully utilized to meet drought/disaster early warning needs of government food security managers.

AISC used this qualitative assessment program to track and report the African drought situation during the period 1982-1984. Beginning in late October 1984, and at the request of AID, AISC provided expanded assessments on the drought situation (Mali, Niger, Chad and Sudan). Breakthroughs in the use of daily meteorological satellite data to assess drought impact significantly increased the value of these "Special Assessments." It is within this context that NOAA and AID (OFDA in close coordination with the AID Bureau for Africa) developed the current Special Climatic Impact Assessment and Technical Assistance Program for the Sahel and Horn of Africa Countries.

AISC uses a combination of daily meteorological satellite products and daily weather data as the primary inputs for the Special Climatic Impact Assessments. Operational rainfall reports from the countries are provided to AISC by the NOAA National Weather Service/Climatic Analysis Center (NWS/CAC) which receives these data through the World Meteorological Organization's Global Telecommunications System. AISC also receives ten day rainfall reports directly from some countries and, in particular, through Regional AGRHYMET Center in Niamey, Niger. AISC uses data from the European Space Agencies' Geo-Stationary Meteorological Satellite (METEOSAT) and the NOAA-9 daily polar orbiting satellite. METEOSAT images are used as one method to assess regional rainfall and to monitor large-scale weather patterns. Weather analysis products and data provided by NWS/CAC are also used in this large-scale analysis. NOAA-9 data obtained from the NOAA National Environmental Satellite, Data and Information Service (NESDIS) are used to assess vegetation/biomass patterns and to estimate rainfall.

AISC uses all available satellite products and weather station reports to assess the impact of rainfall on subsistence crops and rangelands. The assessment process involves the integration and evaluation of these data sources which are cross-checked with each other. Ten day, monthly and seasonal rainfall amounts are analyzed for the current crop season and with respect to conditions during the previous 30 years. The newly developed color satellite images (5 kilometer resolution), which provide an overview of the surface vegetation/biomass conditions, are used to integrate and interpolate other data sets. NOAA satellite derived vegetation/biomass indexes are used to qualitatively assess the evolution of current growing season conditions. Both color images and vegetation indexes are used to compare the current year with previous years, 1983-1984. AISC uses various agroclimatic rainfall index models, satellite models, and historical agricultural statistics (obtained from USDA, USAID Missions and in-country sources) to quantitatively assess the impact of rainfall on crop yields by administrative region in each country. Although AISC does not assess the impact of non-weather factors on crop yield (for example, losses due to pests and disease or the availability of seeds for planting), rainfall variability alone usually accounts for approximately 70 percent of the year-to-year changes in crop yield within semi-arid regions of Africa.

The assessments consist of a variety of cables and published reports which are sent to users and other interested parties. Products provided to U.S. Field Missions and host-countries include a monthly published report which is air expressed to each country and at least three types of cables. The monthly published special assessments contain meteorological satellite images, satellite derived vegetation/biomass indexes, narrative analysis of current crop and rangeland conditions, and assorted maps, graphs, charts and tables which support the narrative analysis. Each country report begins with an overview of the Sub-Saharan situation and is followed by a detailed country specific analysis. The narrative within the assessment is sent to American Embassies by cable which arrives within hours of transmission and ten day updates are provided in the same manner. A regional composite report, which contains all of the information from the eleven country reports is prepared for distribution throughout the U.S. Government. Beginning this month, quantitative assessments of weather impacts on crop yield are being provided to USG and U. S. Field Missions via cable.

Coordination of the assessment information within the U.S. Government is accomplished by participation in regularly scheduled AID and USDA Task Force Meetings on the African Food Emergency and, secondly, through working level discussions with several U. S. Government agencies as the assessments are being prepared. AISC provides briefings on the current situation to the Task Force Committees and as requested by other interested agencies within the U.S. Government. Coordination with USAID Missions is developing into a two way dialogue. The U. S. AID Missions are a key element in the process as they represent the best source of ground-truth information. They are in the best position to evaluate and use AISC assessments, for example, for incorporation of non-weather factors into yield forecasts and using in-country data on current year crop area to estimate crop production. Questions asked by the missions and answered by AISC through the Special Assessments including immediate cable traffic provide a mechanism to incorporate all available information into the food security decision making process in each country. In addition, AISC assessments are routinely provided to various United Nations agencies including the FAO, WMO, and UNDRO.

AISC assessments contribute to emergency food relief planning by: (1) providing early warning of weather impacts on subsistence agriculture and rangelands and (2) by measuring the weather induced variability in crop yield. This information helps others forecast crop production and assess food need requirements linked to vulnerable populations and logistical constraints.

Feedback on this special climatic impact assessment activity from USAID Missions and host-countries has been strongly supportive and the preliminary results on the 1985 season are promising. In Mali, USAID Bamako has stated that AISC Special Assessment information, including regional vegetation/biomass index analyses provided during December 1984, represented the single most important piece of information which lead to a doubling of emergency food need requirements for 1985. The American Embassy at Addis Ababa, Ethiopia has also been a strong advocate of the NOAA/AID Special Assessment Program. Most recently, they used AISC assessment information sent by cable to estimate food shortage requirements for 1986. A cable was received last week by the State Department specifically commending NOAA/AISC's timely and useful crop assessments. In addition, several other USAID Missions have continued to express strong support for the new NOAA/AID project.

During October 1985, AISC representatives will visit project countries to explain the special assessments including crop yield forecasts. These visits follow-up earlier visits during July 1985. Additional technical assistance will include decision maker and professional seminars which will focus on assessment utilization. U. S. based short-term training courses will be conducted for professionals from each Sahelian country. The project has provisions to introduce the technology to government officials from interested countries in eastern and southern Africa by conducting an orientation seminar within the region.

In summary, we believe that this two-year special climatic impact assessment program is leading to significant improvements in drought/disaster early warning and contingency planning for famine relief in Africa.

SEND: IMMEDIATE PRECEDENCE
AGENCY: NESDIS/ASSESSMENT AND INFORMATION SERVICES CENTER/CLIMATIC ASSESSMENT BRANCH

CLASSIFICATION: UNCLASSIFIED

ACCOUNTING CLASSIFICATION: EE4200/8N3D0406

SAMPLE AGRICULTURAL ASSESSMENT CABLE

DRAFTER: LSTEYAERT, CIAD - 634-1822

APPROVED: DLECOMTE, CAB - 634-1821

INFO: AMEMBASSY ROME
USMISSION USUN NEW YORK
SECSTATE WASHDC
FOR USAID PASS TO ATWOOD

TO: AMEMBASSY ADDIS ABABA

FM: NOAA/NESDIS CLIMATE IMPACT ASSESSMENT FOR ETHIOPIA

REF: A) ADDIS ABABA 05045
B) NOAA/NESDIS AUG 9 CLIMATE ASSESSMENT REPORT

1. ASSESSMENT OF 1985 RAINFALL IMPACTS ON ETHIOPIAN AGRICULTURE IS PROVIDED AS REQUESTED BY REFTEL A. EMPHASIS IS PLACED ON 1985 MAIZE AND TEFF CROPS. THIS ANALYSIS SUPPLEMENTS AND UPDATES REFTEL B.

2. NOAA SATELLITE IMAGERY AND RAINFALL STATION DATA THROUGH AUGUST 1985 SUGGEST THE POTENTIAL FOR NEAR NORMAL TO ABOVE NORMAL CROP YIELDS THROUGHOUT MOST OF ETHIOPIA. SOME DROUGHT IMPACTS CAN BE ANTICIPATED IN FOUR GENERAL AREAS AS FOLLOWS.

A. AS REPORTED IN REFTEL B, BELOW-AVERAGE RAINFALL HAS AFFECTED CROPS WITHIN PORTIONS OF NORTHERN SHOA, WESTERN WOLLO AND SOUTHERN TIGRAI (I.E., AS DEFINED WITHIN THE RECTANGULAR BOX DETERMINED BY 10 DEGREES NORTH LAT., 40 DEGREES EAST LONG., 14 DEGREES NORTH LAT. AND 38 DEGREES EAST LONG.)

B. ALTHOUGH RAINFALL DATA REPORTS ARE NOT AVAILABLE FOR CONFIRMATION, SATELLITE IMAGERY SUGGEST DRYNESS HAS ALSO AFFECTED CROPS GROWN ALONG THE EASTERN SLOPES OF THE EASTERN ESCARPMENT. THIS INCLUDES CEREAL CROPS (TEFF, WHEAT, AND MAIZE) GROWN AT HIGHER ELEVATIONS WITHIN THE NARROW NORTH-SOUTH ZONE LOCATED JUST TO THE EAST OF THE NORTH-SOUTH AXIS DETERMINED BY DEBRA BERHAN, KEMBOLCHA AND ADIGRAT. MOREOVER, SATELLITE IMAGERY FOR JULY ALSO SUGGEST THAT SUBSISTENCE MILLET AND SORGHUM CROPS AS WELL AS GRASSLANDS AT LOWER ELEVATIONS WITHIN THE REGION TO THE SOUTH OF THE DANKALI PLAIN AND WITHIN SOUTHERN WOLLO AND NORTHERN HARARGE PROVINCES MAY ALSO HAVE EXPERIENCED DRY CONDITIONS.

C. THE THIRD DROUGHT AFFECTED AREA IS WITHIN NORTHERN ERITREA PROVINCE TO THE WEST AND NORTHWEST OF ASMERA. VEGETATION/BIOMASS PATTERNS IN THIS SUBSISTENCE CROPPING AREA ARE MUCH WORSE THAN THOSE IN 1984.

D. RAINFALL DATA SUGGEST SOME DRYNESS IN THE VICINITY OF GOBA IN NORTHWESTERN BALE PROVINCE.

3. SEASONAL RAINFALL ESTIMATES AND AGROCLIMATIC/CROP CONDITION INDEXES FOR MAIZE AND TEFF CROPS (BY PROVINCE) ARE PROVIDED IN THE FOLLOWING TABLE. COLUMN I IS THE PROVINCE, COLUMN II IS MAY-AUG 20 1985 RAINFALL AS A PERCENT OF NORMAL, COLUMN III IS THE CROP CONDITION INDEX FOR MAIZE AND COLUMN IV IS THE CROP CONDITION INDEX FOR TEFF. CROP INDEXES ARE EXPRESSED IN PERCENTILES ON A SCALE FROM 0 TO 100 (REPRESENTING CROP FAILURE TO BUMPER CROP YIELD LEVELS, RESPECTIVELY). NORMAL CROP YIELDS ARE ASSOCIATED WITH INDEX VALUES OF 50.

COL I	COL II	COL III	COL IV
ARSSI	110	50	60
BALE	80	35	35
ERITREA	125	65	65
GAMO GOFA	100	50	50
GOJAM	95	40	40
GONDER	95	50	60
HARARGE	90	40	50
ILLUBABOR	100	60	50
KEFFA	100	55	50
SHOA	110	40	55
SIDAMO	85	45	55
TIGRAI	75	30	30
WOLLEGA	85	65	50
WOLLO	70	30	30
NATIONAL		55	60

4. SEASONAL RAINFALL ESTIMATES AND AGROCLIMATIC CROP CONDITION INDEXES SUGGEST NEAR NORMAL TO ABOVE NORMAL MAIZE AND TEFF YIELDS FOR ALL PROVINCES EXCEPT FOR BALE, WOLLO AND TIGRAI. MAIZE CROPS NEAR KEMBOLCHA (WOLLO PROVINCE) AND TO THE SOUTH IN NORTHERN SHOA WERE MOST AFFECTED BY DRYNESS.

5. THE FOLLOWING FIVE YEAR CROP DATA AVERAGES (1979-1983) FOR ETHIOPIAN MAIZE AND TEFF WERE DETERMINED FROM PROVINCIAL DATA CONTAINED WITHIN THE DECEMBER 1984 GOE CENTRAL STATISTICAL OFFICE REPORT, (TIME SERIES DATA ON AREA, PRODUCTION AND YIELD OF PRINCIPAL CROPS). COLUMNS II AND V ARE FIVE YEAR AVERAGE YIELD FOR MAIZE AND TEFF, RESPECTIVELY. UNITS ARE METRIC TONS PER HECTARE. COLUMNS III AND VI ARE FIVE YEAR AVERAGE AREA (THOUSANDS OF HECTARES) FOR MAIZE AND TEFF, RESPECTIVELY. COLUMNS IV AND VII ARE FIVE YEAR AVERAGE PRODUCTION (THOUSANDS OF METRIC TONS) FOR MAIZE AND TEFF, RESPECTIVELY.

COL I	II	III	IV	V	VI	VII
ARSSI	1.4	39.4	56.8	1.0	36.7	37.3

BALE	1.2	7.3	8.7	0.6	4.0	2.6
ERITREA	1.0	17.6	16.8	0.7	26.2	19.0
GAMO GOFA	1.2	37.4	43.8	0.6	15.8	9.3
GOJAM	1.9	81.3	150.7	0.9	282.0	242.1
GONDER	1.2	23.2	28.7	0.8	171.4	142.8
HARARGE	1.9	49.1	94.0	1.4	13.4	18.3
ILLUBABOR	2.0	42.2	89.1	1.1	35.0	38.6
KEFFA	2.0	84.2	166.6	0.9	58.7	50.7
SHOA	1.7	167.2	291.6	1.2	311.0	360.9
SIDAMO	1.7	75.3	128.9	1.0	24.2	24.2
TIGRAI	1.6	6.9	10.7	0.8	65.3	50.2
WOLLEGA	2.0	123.1	241.4	0.8	152.1	120.6
WOLLO	1.5	19.9	30.0	1.1	133.7	140.0
NATIONAL	1.8	777.1	1357.8	1.0	1329.5	1256.6

6. NOAA/NESDIS ONLY RECENTLY (AUGUST 26) OBTAINED COPY OF GOE ANNUAL AGRICULTURAL DATA USED TO CALCULATE BASELINE AVERAGES (PARA. 5). DATA SETS ARE STILL BEING ANALYZED. DATA FOR SOME YEARS (E.G., 1982 AND 1983) APPEAR TO BE INCONSISTENT WITH THOSE OF PREVIOUS YEARS. NOAA/NESDIS IS WORKING TO RESOLVE THESE INCONSISTENCIES SO RELIABLE BASELINE AVERAGES CAN BE DETERMINED. BASELINE AVERAGES ARE ESSENTIAL FOR INTERPRETATION OF CROP INDEX INFORMATION USED TO MAKE QUANTITATIVE YIELD ASSESSMENTS. MISSION COMMENTS ON VALIDITY OF FIVE YEAR BASELINE AVERAGES PROVIDED IN PARA. 5 WILL BE APPRECIATED.

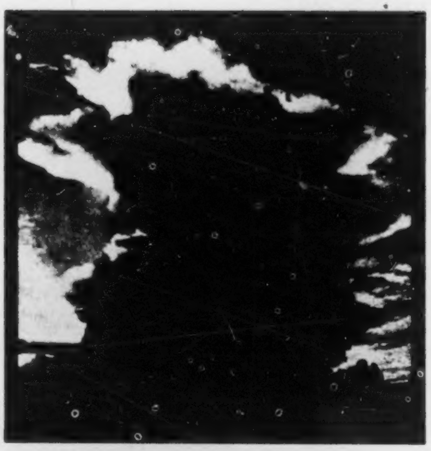
(ORIGIN: AISC/NESDIS/NOAA/SPROCTOR)

ABBREVIATED REPORT

FULL REPORT IN COMMITTEE FILES

Climate Impact Assessment

Foreign Countries



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Environmental Data and Information Service
Center for Environmental Assessment Services

Briefing Book:
AISC Climate Impact Assessment Program

Meteorologist
&
Climatologist
Agricultural
Economist
Decision
Maker

January 1985

Table of Contents

Aisc Climate Impact Assessment Program	1 - 11
AISC/AID Assessment Program	12 - 17
Assessment Process Input and Output	18 - 21
Africa Drought	22 - 27
Technical Assistance to Developing Countries	28 - 29
Cost	30

Appendices

1. *Climate Impact Assessment Technology: Disaster Early Warning and Technical Assistance in the Developing World*

2. *A New Method of Incorporating Meteorological Satellite Data into Global Monitoring*

3. *Niger: Special Assessment*

4. *Mali: Special Assessment*

5. *Sudan: Special Assessment*

6. *Special Assessment Cables*

AISC GOAL

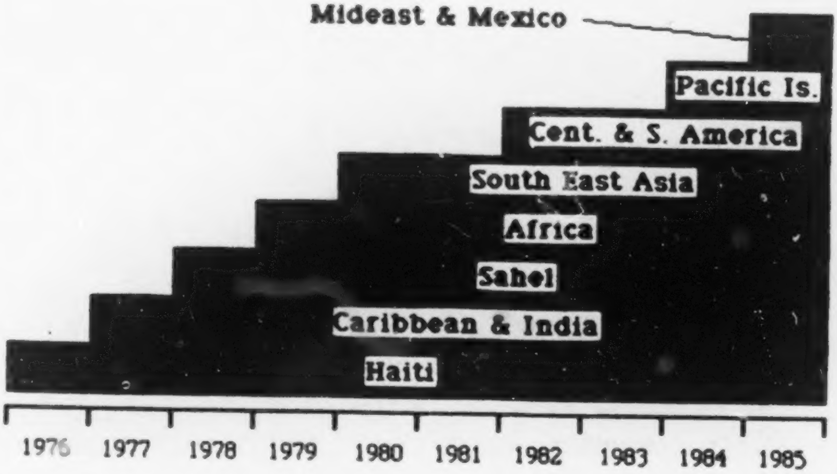
To mitigate drought disasters with an early warning notification system

DROUGHT -- A "CREEPING" NATURAL DISASTER WHICH CAUSES

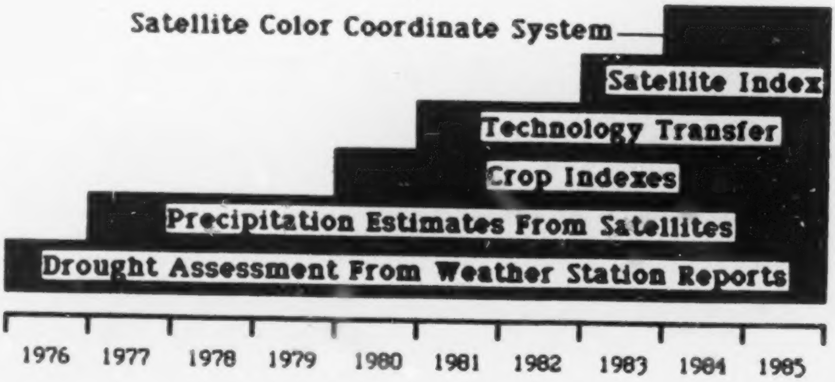
- CROP FAILURES
- ECONOMIC LOSSES
- DISASTROUS FOOD SHORTAGES

Drought, the subtle, creeping natural disasaster, can expand over vast areas and last for months or even years. It is the principal weather related disaster facing most of the worlds developing countries. Drought can cause crop failures which can lead to disastrous food shortages which in turn put severe strains on already over burdened economies. A drought has no sharp beginning; rather, the drought develops slowly and builds each day until one day the rains can do no good even if they come. A constant vigil must be kept for every growing region of every developing country if droughts are to be spotted in time to prevent suffering.

Area Covered by AISC Drought Early Warning Assessments



Technological Expansion



ASSESSMENT VERIFICATION RESULTS BASED ON GROUND-TRUTH INFORMATION (1979-1983) FOR 72 COUNTRIES

- **Drought can be reliably assessed 30-60 days before crop harvesting begins**

- **Forecast lead-times on impacts**

    - **30 Days on crop yield losses**
    - **60 Days on price changes**
    - **90 Days on import/export decisions**
    - **90 to 180 Days on food shortages**

Sub-Saharan Africa: 1979

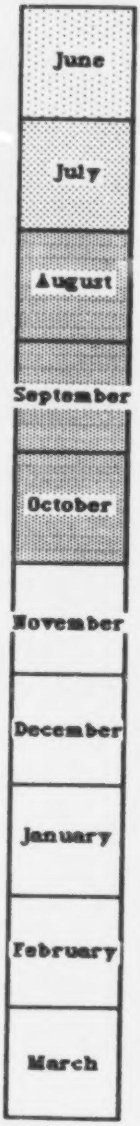
Drought Early Warning

Normal Crop

Moderate Drought Impact

Severe Drought Impact

Impact Verification


June
July
August
September
October
November
December
January
February
March

Senegal -- Food Shortage
Chad -- Civil War

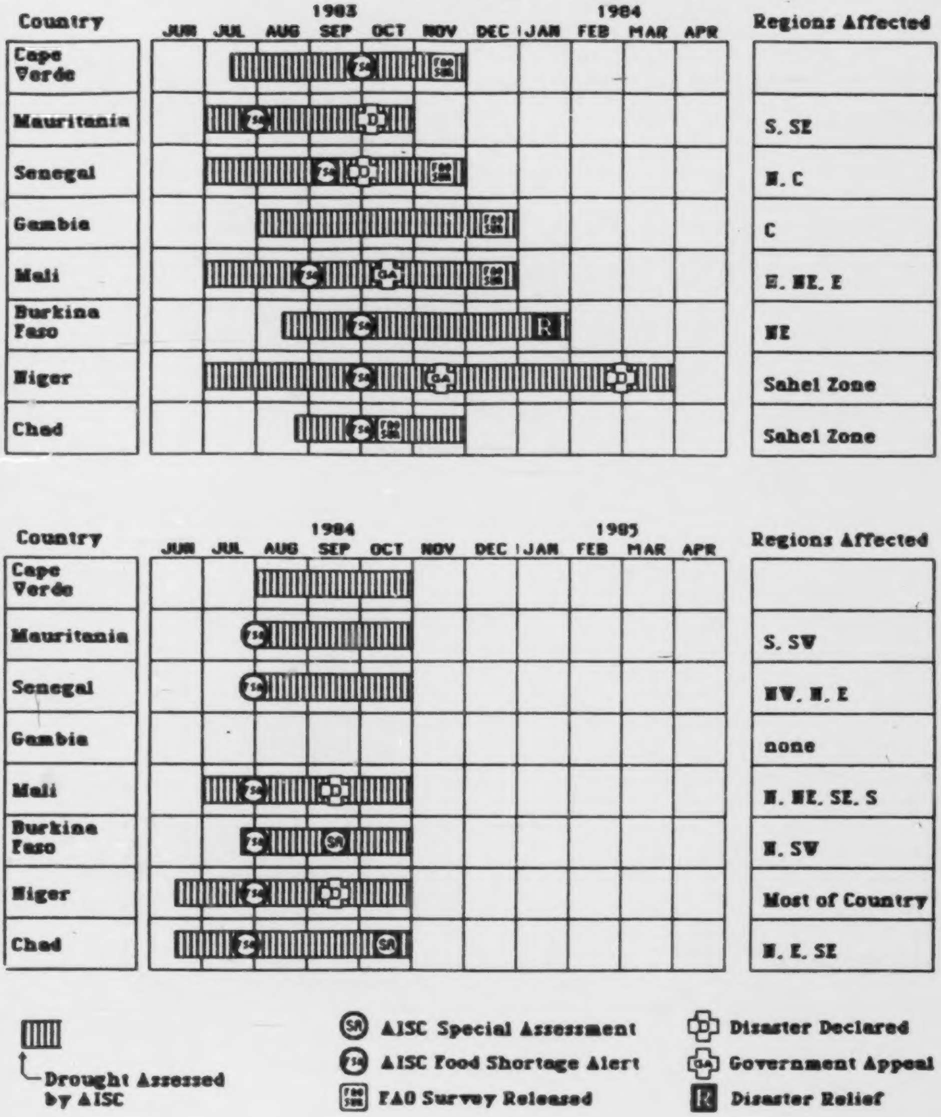
Sudan -- Refugees
Mauritania -- Food Shortage

Mali -- Food Shortage

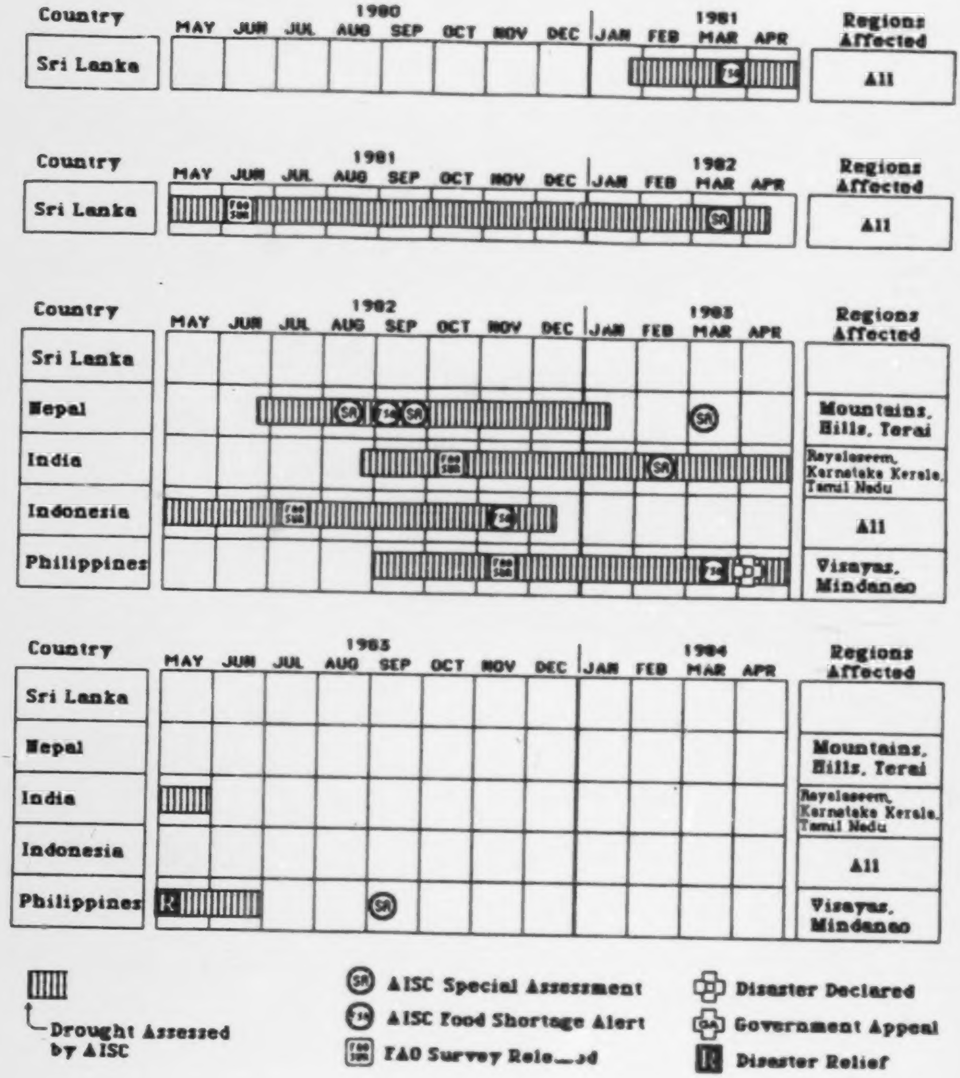
The Gambia -- Food Shortage

Upper Volta -- Limited Relief

Recent Verification



Recent Verification



AISC CLIMATE IMPACT ASSESSMENT PROGRAM

- **Low cost**
- **Reliable**
- **Timely**
    - **Monthly reports with weekly updates as required**
    - **Special reports**

Assessment Process Outputs

1. Scheduled Publications: ***Monthly Climate Impact Assessment, Foreign Countries*** with weekly updates as needed.

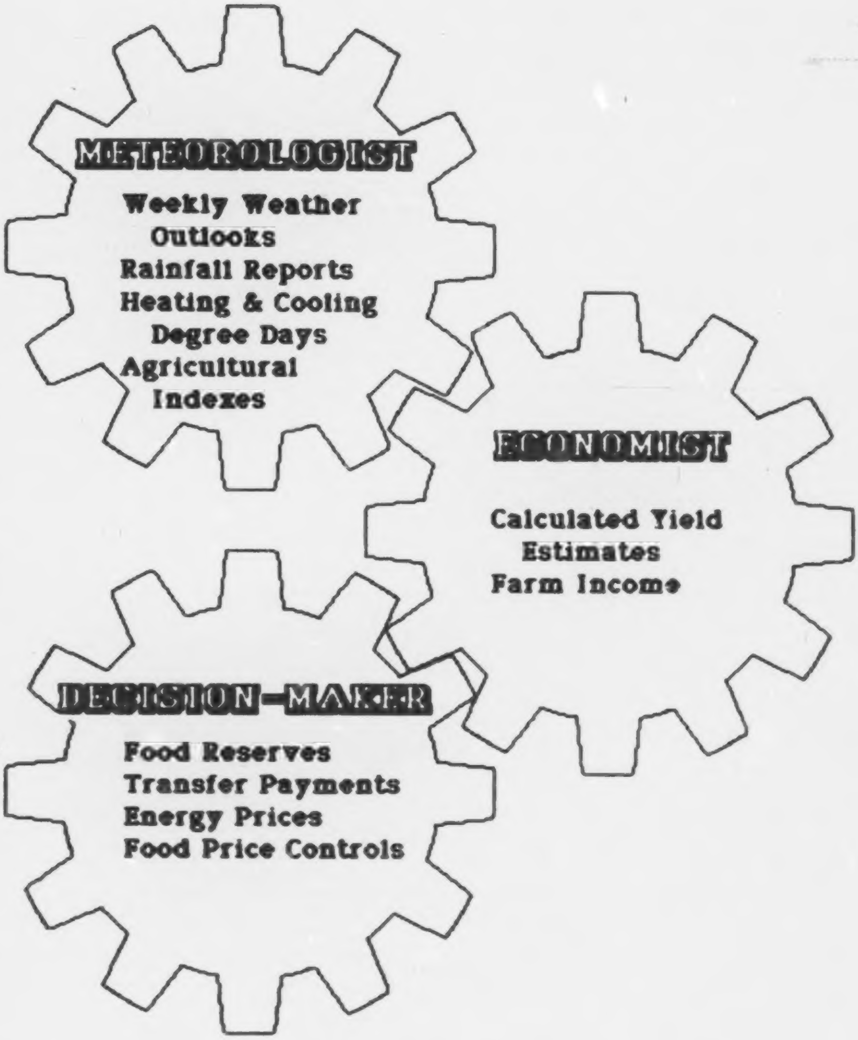
2. ***Early Warning Assessment Cables*** are routinely sent over the State Department communications network to US Embassies, AID Missions, and Peace Corps units throughout the developing world..

3. ***Special Assessments*** of particular weather disasters are provided by AISC upon request from the field or Washington offices of AID or State Department. The assessments are in the form of cables or written reports depending on requirements of the requestor.

4. ***Major Abnormals:*** A monthly map and brief description of all anomalous climate impacts throughout the world.

5. ***Technical Assistance Training Guides***

Increased Accuracy of Economic Projections Through Incorporation of Weather Anomalies



METEOROLOGIST

- Weekly Weather Outlooks
- Rainfall Reports
- Heating & Cooling Degree Days
- Agricultural Indexes

ECONOMIST

- Calculated Yield Estimates
- Farm Income

DECISION-MAKER

- Food Reserves
- Transfer Payments
- Energy Prices
- Food Price Controls

The Climate Assessment Branch (CAB) in Washington, DC works with the Models Branch in Columbia, Missouri to produce early warning impact assessment reports. The Models Branch is located next to the University of Missouri at Columbia and takes advantage of the modeling and agricultural expertise on the university staff. This relationship has existed since 1974 and has been particularly successful and productive.

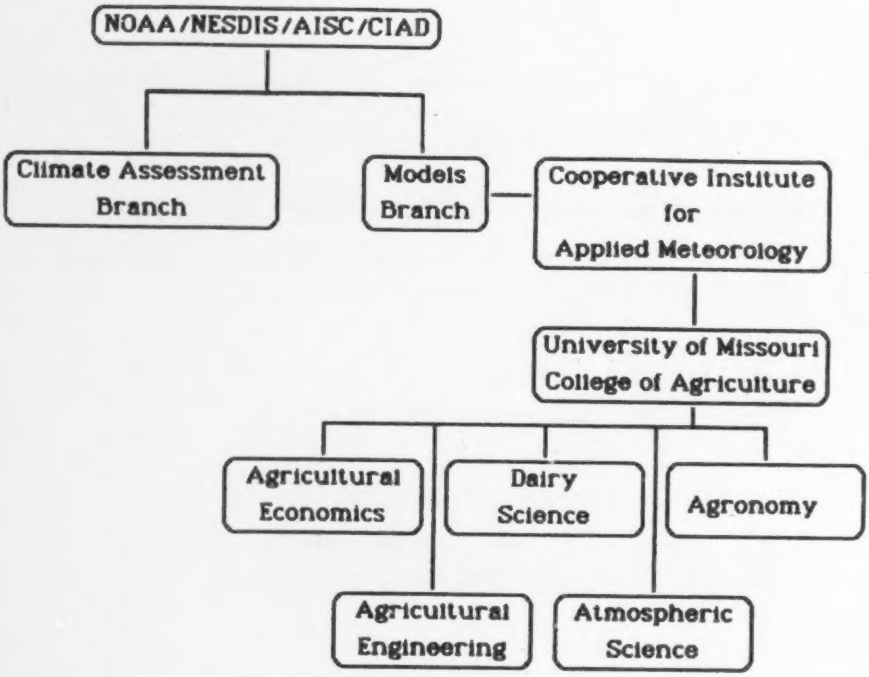
NOAA
CLIMATIC IMPACT ASSESSMENT PROGRAM FOR AID

- MAKE OPERATIONAL EARLY WARNING ASSESSMENTS
- TRANSFER AGROCLIMATIC MODELING AND IMPACT ASSESSMENT TECHNOLOGY
- IMPROVE ASSESSMENTS
  - WEATHER SATELLITES
  - CLIMATIC STUDIES
  - AGROCLIMATIC MODELS
  - IMPACT MITIGATION PROCEDURES
- COMMUNICATE THE TECHNOLOGY

SHORT-TERM AGRICULTURE-RELATED ECONOMIC BENEFITS

		Season		
	Pre-Season Planning	Planting	30 Days Before Harvest	Past Harvest
Food Stocks/Storage Reserves	🌽		🌽	🌽
Import/Export Requirements	🌽		🌽	🌽
Regional Distribution	🌽		🌽	🌽
Shipping Modes/Schedules	🌽		🌽	🌽
Marketing Strategies	🌽	🌽	🌽	🌽
Price Incentives	🌽	🌽	🌽	🌽
Verification of Crop Insurance Claims	🌽		🌽	🌽
Improved Technology Input (Fertilizer, Insecticide, Pesticide, etc.)	🌽	🌽	🌽	
Irrigation Requirements/Pricing	🌽	🌽	🌽	

Assessment Organizational Structure


NOAA/NESDIS/AISC/CIAD
Climate Assessment Branch
Models Branch
Cooperative Institute for Applied Meteorology
University of Missouri College of Agriculture
Agricultural Economics
Dairy Science
Agronomy
Agricultural Engineering
Atmospheric Science

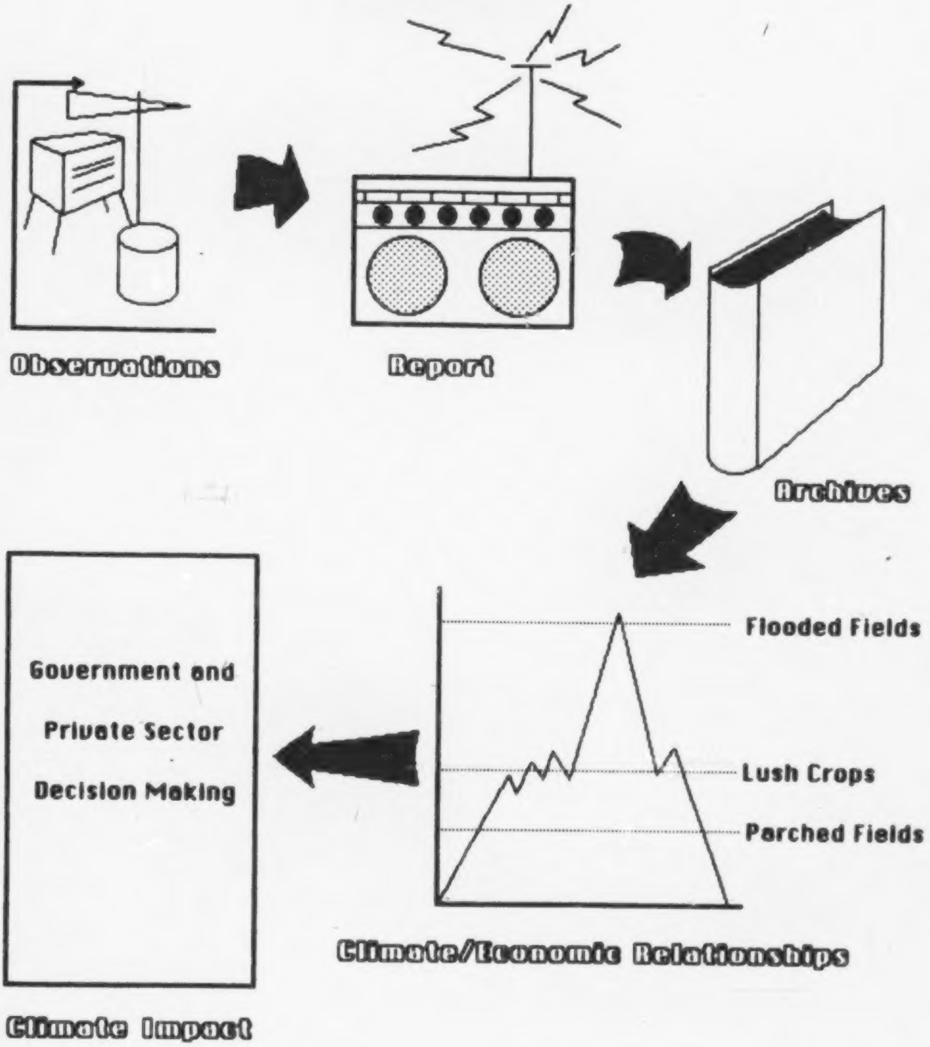
Cooperative Institute for Applied Meteorology

- Provide monthly *Satellite Assessment Subsystem Report*
- Develop assessment capability using existing information
- Acquire and quality control historic meteorological data for use in putting current data in perspective
- Develop and improve indexes for agroclimatic assessments
- Train personnel from developing countries to use NOAA procedures in their assessment and warning programs

Personnel

Economists
Agricultural Economist
Agricultural Meteorologist
Meteorologists
Remote Sensing Specialists
Statisticians
Agricultural Statisticians
Agronomists
Dairy Scientists

CLIMATE ASSESSMENT PROCESS


Observations
Report
Archives
Government and
Private Sector
Decision Making
Flooded Fields
Lush Crops
Parched Fields
Climate/Economic Relationships
Climate Impact

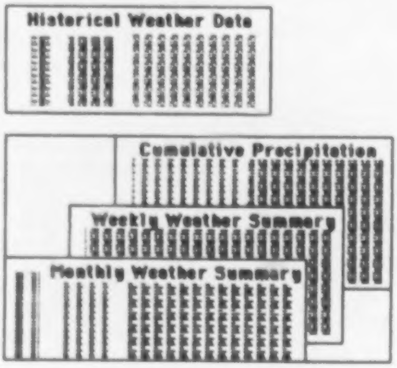
Climate Impact Assessments prepared by NOAA's Assessment and Information Services Center (AISC) form the link between meteorological events and the extent and severity of their impact.

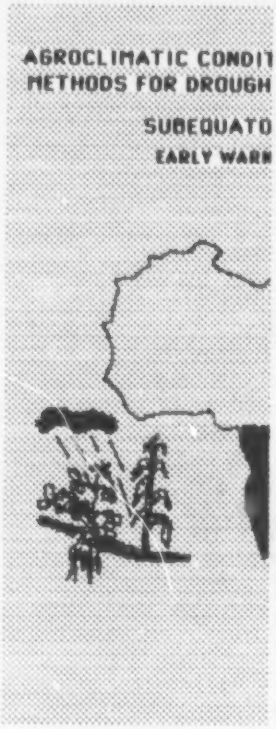
ASSESSMENT PROCESS

Meteorological Satellites for Rainfall Estimation

Meteosat
Polar Orbiting
GOES

Weather Summaries

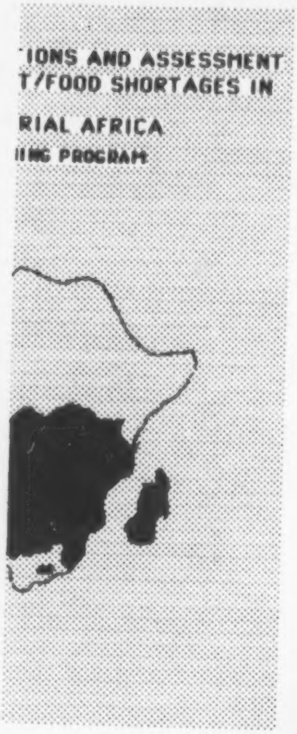

Historical Weather Data
Cumulative Precipitation
Weekly Weather Summary
Monthly Weather Summary



AGROCLIMATIC CONDIT
METHODS FOR DROUGH
SUBEQUATO
EARLY WARN

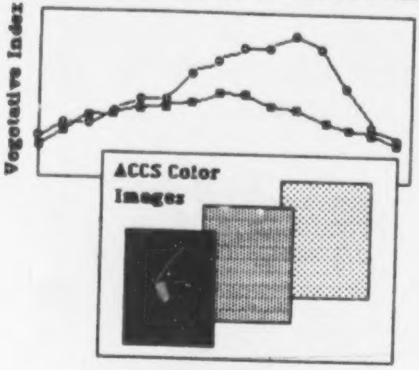
AISC Indexes and

INPUT SOURCES

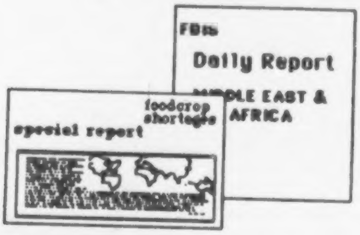

IONS AND ASSESSMENT
T/FOOD SHORTAGES IN
RIAL AFRICA
ING PROGRAM

Crop Calendars

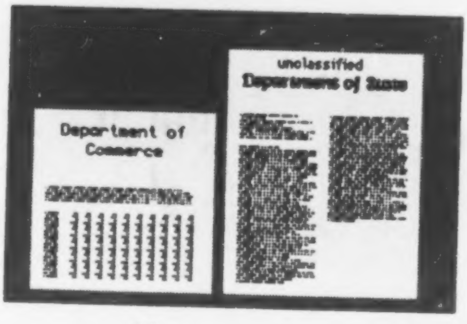
Satellite Crop Monitoring



Foreign Broadcasts

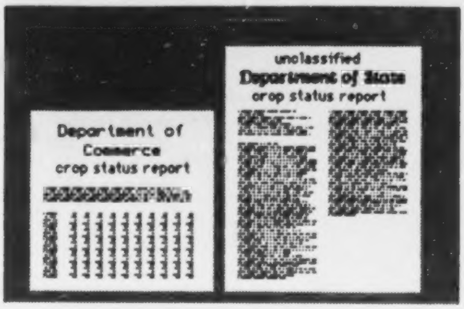

FBIS
Daily Report
DLE EAST &
AFRICA
foodcrop shortages
special report

Cables


unclassified
Department of State
Department of Commerce

ASSESSMENT

Scheduled Crop Status Cables

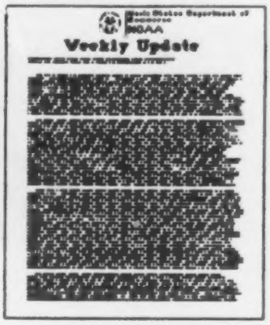


Department of Commerce
crop status report

unclassified
Department of State
crop status report

Scheduled Assessments and Routine Updates

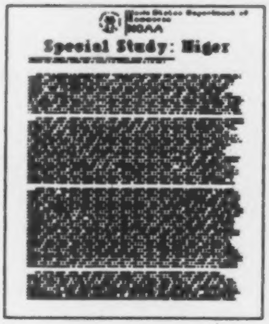
Climate
Impact
Assessment
Foreign



NOAA

Weekly Update

Special Reports by Request

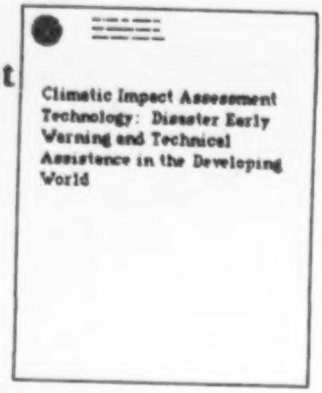


NOAA

Special Study: Niger

OUTPUTS

Training Assessment



Climatic Impact Assessment Technology: Disaster Early Warning and Technical Assistance in the Developing World

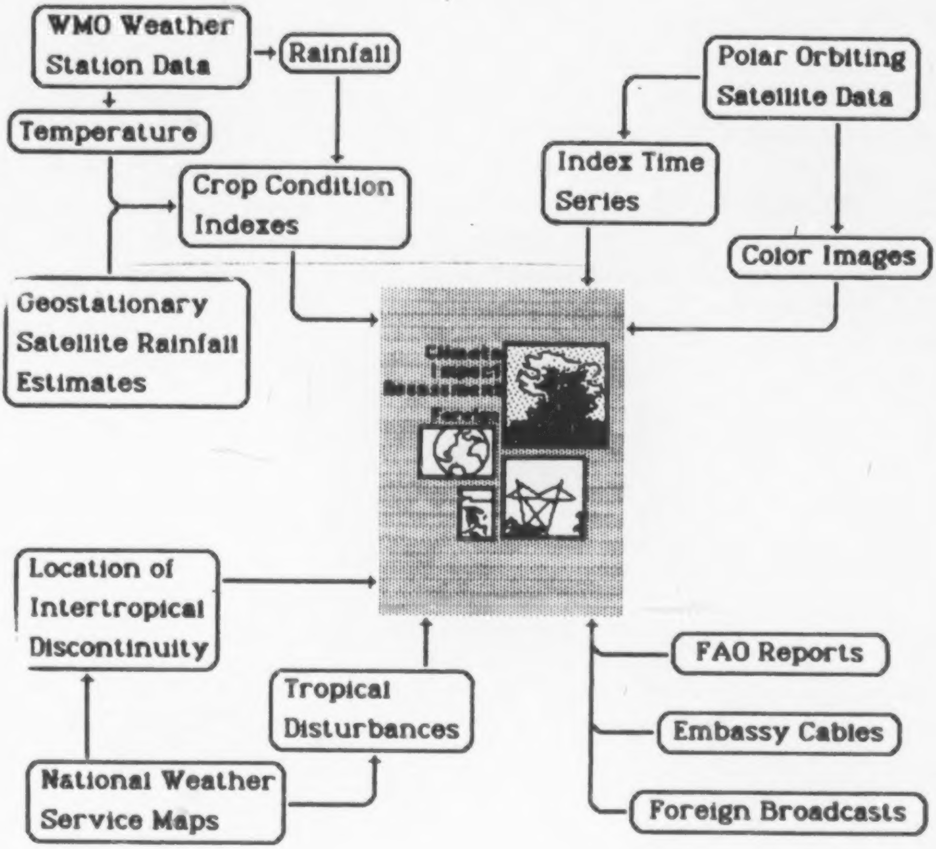
Major Abnormals

Impacts of World Weather Events

Foreign Annual Assessment

Climate
Impact
Assessment
Foreign
Annual

The Drought Assessment Process



WMO Weather Station Data

Rainfall

Temperature

Crop Condition Indexes

Geostationary Satellite Rainfall Estimates

Polar Orbiting Satellite Data

Index Time Series

Color Images

Location of Intertropical Discontinuity

Tropical Disturbances

National Weather Service Maps

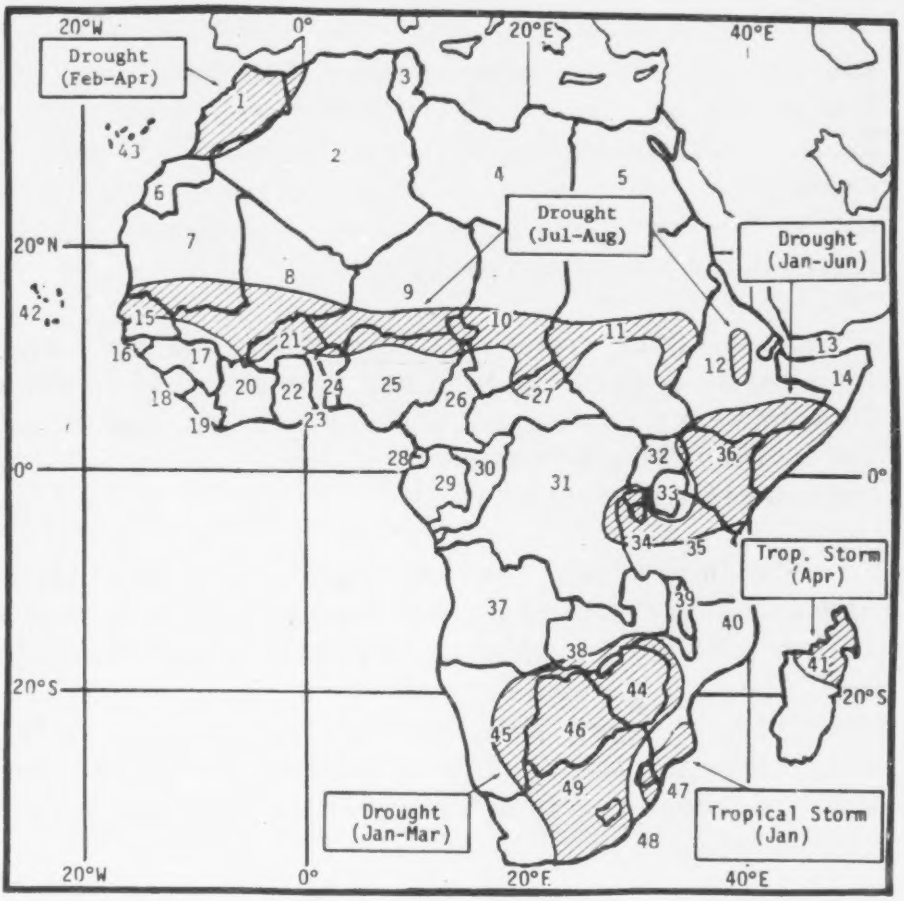
FAO Reports

Embassy Cables

Foreign Broadcasts

Weather observations from WMO weather stations, satellite data of several varieties, weather charts analyzed by the National Weather Service, and reports from the field are the principal data inputs to the assessment process. The analysts who are responsible for preparing the Drought Early Warning Assessments are meteorologists and climatologists with experience and training in agriculture. The various data sources are combined with years of assessment experience to produce final assessments of potential food crop losses. Economic and political factors can further affect food production, but they are not explicitly accounted for by these assessments; rather, the assessments are passed to the economist and the policymaker to produce the final food situation report.

AFRICA
1984


Drought
(Feb-Apr)
Drought
(Jul-Aug)
Drought
(Jan-Jun)
Trop. Storm
(Apr)
Drought
(Jan-Mar)
Tropical Storm
(Jan)
20°W
0°
20°E
40°E
20°N
0°
20°S

1. Morocco
2. Algeria
3. Tunisia
4. Libya
5. Egypt
6. Western Sahara
7. Mauritania
8. Mali
9. Niger
10. Chad
11. Sudan
12. Ethiopia
13. Djibouti
14. Somalia
15. Senegambia
16. Guinea Bissau
17. Guinea
18. Sierra Leone
19. Liberia
20. Ivory Coast
21. Burkina
22. Ghana
23. Togo
24. Benin
25. Nigeria
26. Cameroon
27. Central African Republic
28. Equatorial Guinea
29. Gabon
30. Congo
31. Zaire
32. Uganda
33. Rwanda
34. Burundi
35. Tanzania
36. Kenya
37. Angola
38. Zambia
39. Malawi
40. Mozambique
41. Madagascar
42. Cape Verde Island
43. Canary Islands
44. Zimbabwe
45. Namibia
46. Botswana
47. Swaziland
48. Lesotho
49. South Africa

During 1984 major drought struck three regions of Africa

In Southern Africa hot, dry weather damaged subsistence cereals during January, February, and early March. The drought sharply reduced crop production in Southern Africa, Lesotho, Botswana, Zimbabwe, and parts of Mozambique and Zambia. The impacts were especially severe because these countries all experienced drought losses in the preceding year as well.

In east Africa, crops planted in March and April were damaged by drought the first half of the year in Ethiopia, Somalia, Kenya, Rwanda, and parts of Tanzania, Uganda, and Zaire. The first six months of the year were the driest in over 40 years in central Kenya.

In the third region, the Sahel zone of west and central Africa, near-record heat and dryness during July and August curtailed growth of crops planted in May, June, and July for all harvests. Affected countries include Mauritania, Senegal, Mali, Burkina Faso (Upper Volta), Niger, Nigeria, and Chad. In addition, deficient rains affected crops in parts of Sudan, Ethiopia, and the Central African Republic.

Africa Update
November 1984

- Sahel Countries
    - Growing season over
    - Late rains improved water supples and grasslands but were too late too offset earlier crop damage
    - Food supply outlook unfavorable until late 1985
    - Niger especially hard hit by drought
    - Severe food shortages continue in Chad

- East Africa
    - New crop season underway
    - Normal to excessive rainfall
    - Continuing rains important in Kenya and southern Ethiopia

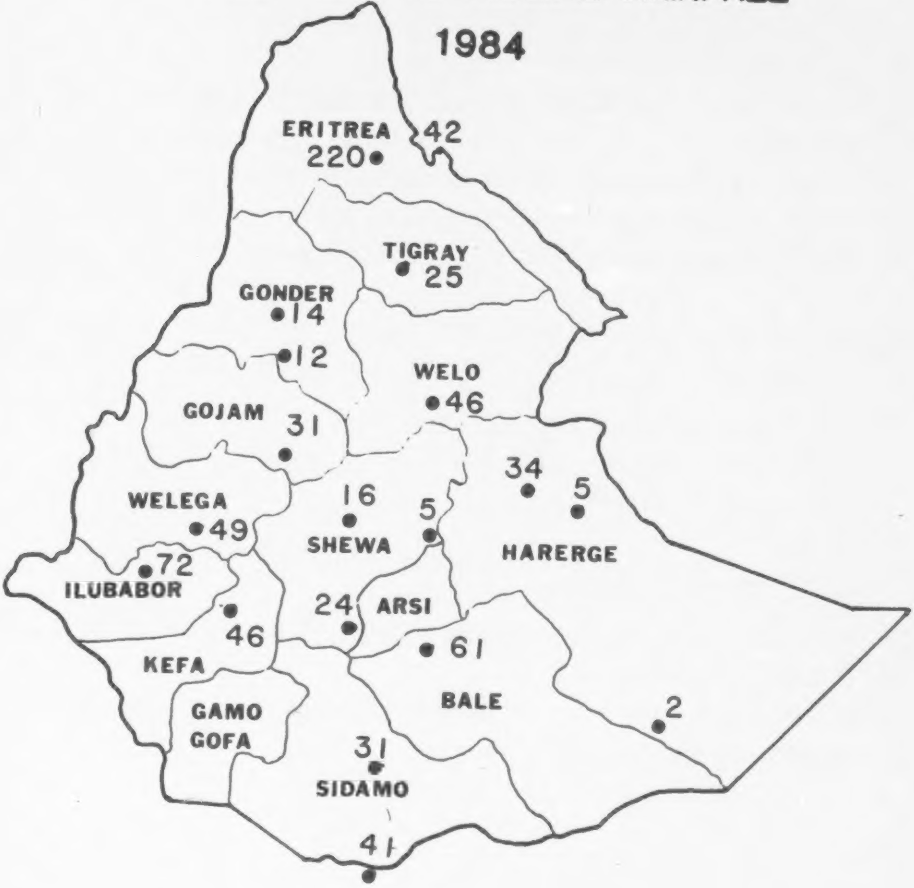
- Southern Africa
    - November/December major planting period
    - Early rains favorable
    - After two years of drought the upcoming growing season is extremely important

ETHIOPIA

AND ITS PROVINCES

FEB - APR % NORMAL RAINFALL

1984


ERITREA
42
220
TIGRAY
25
GONDER
14
12
WELO
46
GOJAM
31
34
5
WELEGA
49
16
5
SHEWA
HARERGE
72
ILUBABOR
24
ARSI
46
61
KEFA
BALE
2
GAMO
GOFA
31
SIDAMO
41

Failure of the belg rains, which normally provide moisture for crops planted in the spring, contributed to food shortages in the provinces of Welo, Bale, Shewa, and Sidamo.

TECHNICAL ASSISTANCE PACKAGE

- **Technical Training Course**
- **Micro Computers**
- **In-Country Technical Assistance**
- **Follow-up Seminar**

AISC's Developing Country Technical Assistance package is designed to provide an independent host-country capability to prepare and use local climate impact assessments.

RECIPIENTS OF AISC TECHNOLOGY TRANSFER

	Country	Scientists	Managers
America	El Salvador	1	
	Belize	1	
	Costa Rica	1	
	Colombia	1	
	Venezuela	2	1
	Equador	2	
	Peru	7	
Africa	Senegal	1	
	Sierra Leone	1	
	Ethiopia	1	
	Niger	2	
Asia	Pakistan	3	2
	India	1	3
	Bangladesh	3	2
	Sri Lanka	3	3
	Nepal	3	3
	Burma	1	
	Thailand	4	2
	Malaysia	3	4
	Indonesia	4	3
	Philippines	3	4
	Singapore	1	
Total	22 countries	49	27

AISC has trained 76 foreign scientists and managers. Training courses have been conducted at the Models Branch in Columbia, Missouri and within host countries.

COSTS TO IMPLEMENT

- **People and Time**
- **Data Resources**
- **Assessment Technology**
- **Computers**

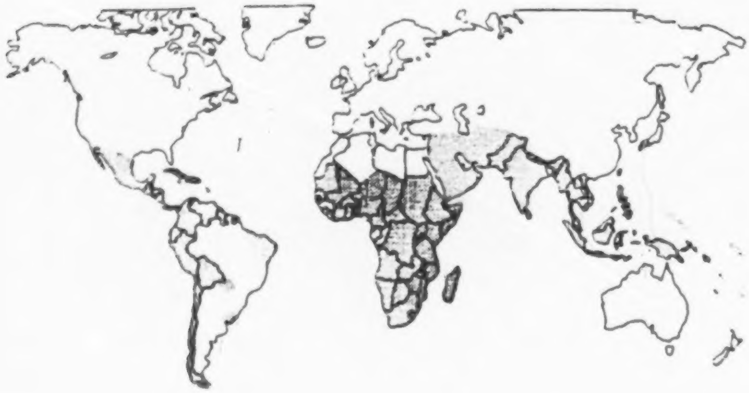
The cost of developing and maintaining a climate impact assessement technology for the developing world has been born by NOAA and AID/OFDA

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Assessment and Information Services Center

Climatic Impact Assessment Technology: Disaster Early Warning and Technical Assistance in the Developing World

Louis T. Steyaert

PROGRAM SCOPE



Washington, D.C.
August 1984

CLIMATIC IMPACT ASSESSMENT TECHNOLOGY: DISASTER EARLY WARNING AND TECHNICAL ASSISTANCE IN THE DEVELOPING WORLD

Louis T. Steyaert

The NOAA/NESDIS Assessment and Information Services Center (AISC) has developed a reliable and cost-effective program to support disaster early warning and technical assistance objectives of the Agency for International Development (AID). The Early Warning Program was developed at the request of the AID Office of U.S. Foreign Disaster Assistance (OFDA) and in cooperation with the University of Missouri-Columbia, US/AID Missions, and host countries. Operational climatic impact assessments routinely provide early warnings of weather impacts on subsistence agricultural crops and the potential for drought caused food shortages with a lead-time of 3-6 months before socio-economic impacts occur. New assessment tools are being developed to improve the existing system which is based primarily on daily weather station reports and supplemented by global meteorological satellite analysis. The technology is being used to assist developing countries improve their own drought/disaster preparedness and food security programs by implementing national climatic impact assessment systems.

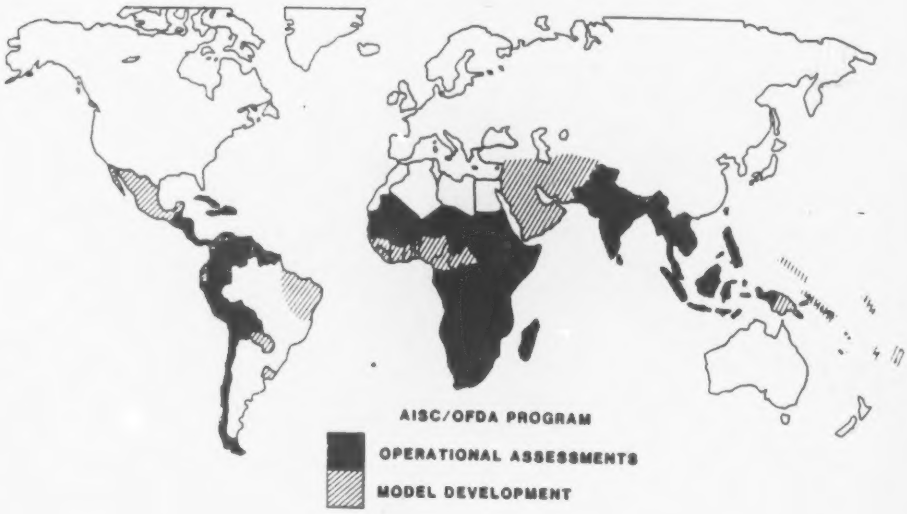
EARLY WARNING PROGRAM

Since July, 1979, AISC has issued biweekly assessments of climatic impacts on food security for developing countries in the Caribbean Basin, Africa, South and Southeast Asia, and more recently, The South Pacific Islands, Central America, and the Andes countries of South America (Figure 1). Decision makers, planners, and economists are provided with timely, reliable information based on continuous monitoring of environmental conditions. The AISC assessment cables are sent through NOAA international communication facilities to American Embassies, AID including overseas missions, the U.S. Department of Agriculture, and various United Nations agencies (e.g., Food and Agriculture Organization). Climatic impact on potential food supplies, subsistence crop conditions and field operations are assessed. Information on crop calendars, estimated soil moisture, and unusual or severe weather events such as flooding, high winds and other meteorological extremes are reported. If available, information from ancillary sources is included to supplement AISC analysis. The result is a cost-effective increase in the lead-time for planning of food assistance strategies and mitigation measures to reduce the adverse impact of climate.

In addition, AISC prepares special assessment reports for AID, e.g.: the 1981/82 drought impact in Bangladesh, Sri Lanka, Malaysia, Tanzania, Botswana; the 1982/83 drought problems in Nepal, Philippines, Ethiopia, Somalia, Uganda, Sudan, Sahel Region, southern Africa, Haiti, NE Brazil and the South Pacific; and more recently Kenya and Tanzania. These were used to estimate the magnitude of drought impact, potential food shortage deficits and/or disaster assistance needs.

Figure 1

PROGRAM SCOPE
OPERATIONAL ASSESSMENTS
NOAA/NESDIS/AISC


AISC/OFDA PROGRAM
■ OPERATIONAL ASSESSMENTS
▨ MODEL DEVELOPMENT

The Costs

AISC is currently providing operational, biweekly assessments for about 80 countries at a total cost of approximately $500,000 per year. This represents a cost of about $6,000 per country to alert AID (OFDA and Food for Peace), the American Embassy, and the government officials in the host country of potential drought problems.

Severe drought is a major problem in the tropics. For example, Figure 2 shows affected regions in 1982/83 and is highly representative of general conditions that have prevailed during the past few years since AISC began making assessments.

The cost of drought to a developing country must be viewed in both human and economic terms. Drought causes crop failure which disrupts the economy and, in extreme cases, undetected drought can lead to food shortages and even famine. Also, it is increasingly recognized that disasters such as drought seriously affect long-term economic development programs.

The economic costs (e.g., less exports and more imports) can represent millions of dollars. Some of this loss can be mitigated by early warning information such as that provided by AISC. The potential economic savings are illustrated by an actual example where one country needed to import an additional 250,000 metric tons of corn. In this case, the world market price of corn increased almost $20 per ton between the time when drought damaged the crops and when the corn was needed. This represents a potential savings of about $5 million dollars. The dollar costs to make assessments (even for AISC) are insignificant compared to the potential savings.

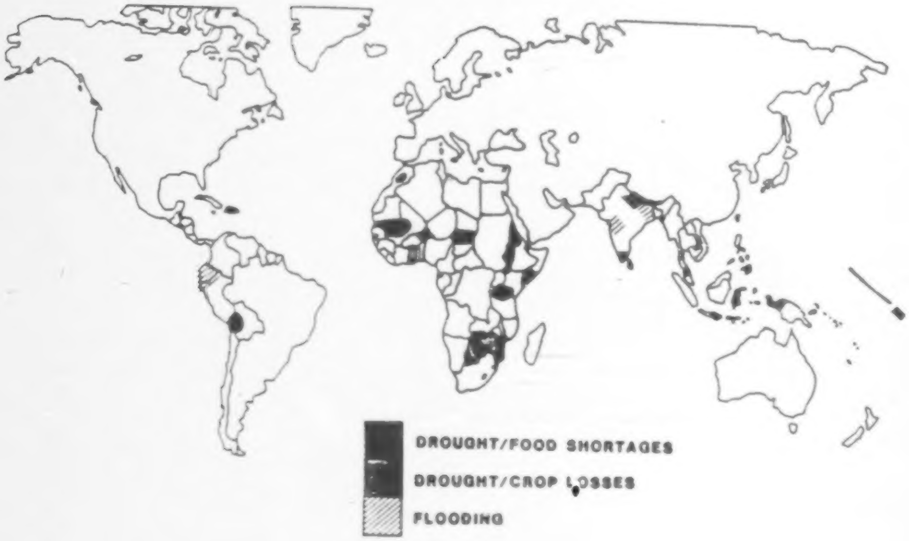
The Benefits

Improved policy and food security management decisions at the national and international levels can lead to partial and even total mitigation of the potential food shortage if timely, reliable early warning information is available to develop the appropriate strategy. AISC assessments represent a management information system to help identify potential problem areas, obtain an initial measure of drought impact, and ensure that there is open and free information exchange to further clarify and monitor the problem. This lead-time reduces the costs for nutritional surveys in the potential problem area and can also be used to obtain and pre-position food supplies in a cost-effective way before malnutrition occurs. For example, AISC assessments have been used by AID Food for Peace to identify and cope with potential food shortage deficits in Africa. In some cases, existing stocks in the host-country can be relocated or potential bumper crops in neighboring regions (also identified by the assessments) can be used to meet requirements. If crop failure is assessed early in the growing season, users of the information can sometimes recommend alternate cropping more suitable for existing and expected weather conditions.

Sufficient early warning can be used as a basis to penetrate international trade markets on more favorable economic terms, thereby saving foreign exchange. Such information can also be used to develop plans to stabilize prices, reduce hoarding, and avert unwarranted fear. Finally, undetected drought and its

Figure 2

ASSESSMENT VERIFICATION: 1982/83
EARLY WARNING PROGRAM
NOAA/NESDIS/AISC


DROUGHT/FOOD SHORTAGES
DROUGHT/CROP LOSSES
FLOODING

impact due to the lack of reliable information has historically resulted in crisis and acted as a "trigger" for civil strife. This technology can provide governments with a sufficient early warning (30 days before crop harvest representing 30-60 days before food prices increase, 90-180 days before potential food shortages) to help mitigate the potential crisis.

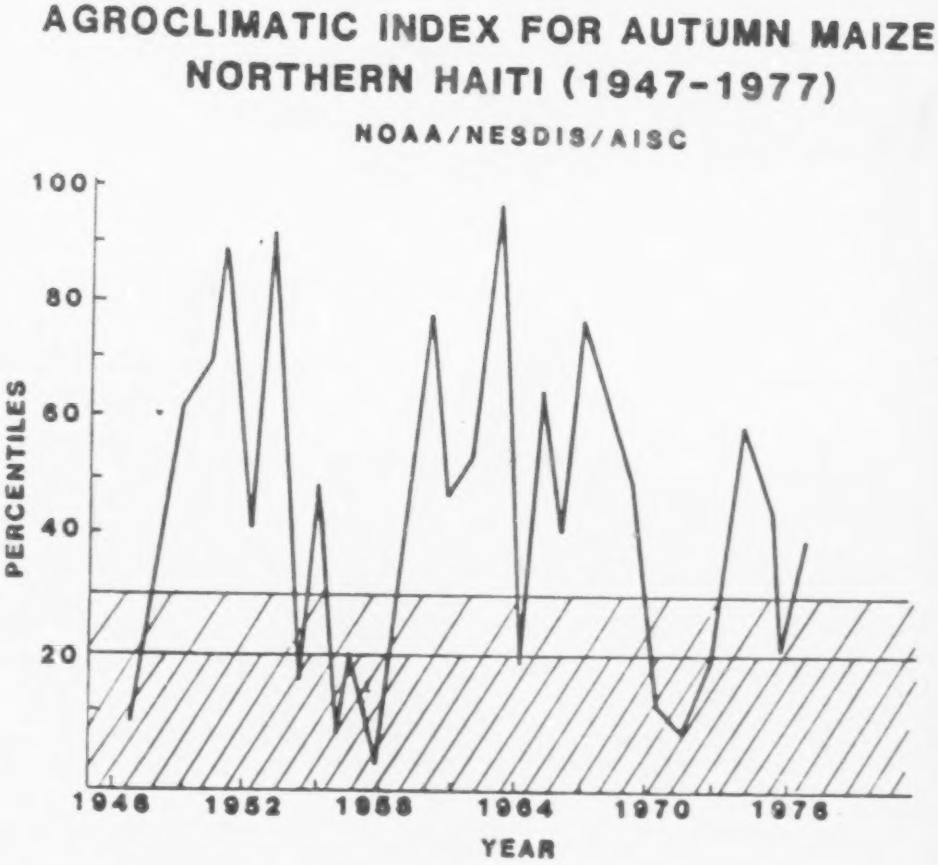
The Methodology

The Early Warning Program is based on weekly rainfall/weather analysis and climatic impact assessment models for more than 350 agroclimatic regions (i.e., regions which are generally homogeneous with respect to agricultural crops and climatic type). Regional rainfall estimates are determined from ground station reports received through an international communications network. Satellite cloud data are used to improve the accuracy of precipitation estimates, particularly in those regions where weather data are sparse and unreliable. Weather data are then interpreted by regional agroclimatic indices which indicate potential crop production in relative terms. Finally, climatic impact and the potential for abnormal food shortages are identified from these indices.

Agroclimatic/crop condition indices are based on derived climatic variables (e.g., soil moisture, plant water deficit and moisture stress) which directly determine the plant's response to environmental conditions, hence productivity. The selection of the regionally appropriate indices is in part determined through the use of episodic event data. For example, candidate indices are qualitatively compared to the historic occurrences of crop failure, food shortages, drought, flooding and other anomalous weather/non-weather events as determined from reports, newspapers, and computerized data bases. Episodic data are also used to "calibrate" the index by establishing a critical threshold which is associated with crop failure and/or drought-related food shortages (Figure 3). The strengths and limitations of all available indices and models are collectively considered in the assessment process.

Documented food shortages determined by in-country field inspections reported b the UN/FAO and American Embassies during 1979-1983 confirmed that AISC assessments consistently provide a 3-6 month alert on potential food shortage situations. Typically, the initial AISC assessment on drought/food shortage conditions was issued 30-60 days before the beginning of the crop harvest. Actual indications of food shortage conditions were not evident until 2-4 months after harvest. The success the program has enjoyed so far has led to an active dialogue between AISC and the Missions. This feedback has helped tailor products, guide development and identify host-country data sets that were not known to us. This has become a most valuable tool in continuing our support to the AID mission.

Figure 3


AGROCLIMATIC INDEX FOR AUTUMN MAIZE
NORTHERN HAITI (1947-1977)
NOAA/NESDIS/AISC
100
80
60
40
20
PERCENTILES
1946
1952
1958
1964
1970
1976
YEAR

TECHNICAL ASSISTANCE PROGRAM

AISC has also been working with AID to assist developing countries implement operational climatic impact assessment programs (Figure 4). The goal of these national programs is to use inexpensive weather information and existing resources as a basis for improving disaster preparedness and food security, i.e., to "save lives and money" through more timely, precise decision making.

These national programs are being implemented through a combination of policymaker seminars, mid-level management workshops, intense technical training and follow-up technical assistance missions. This process is multidisciplinary, and inter-agency (i.e., meteorologists from the National Meteorological Service, economists and statisticians from the Ministry of Agriculture, and policymakers from these two agencies plus the office responsible for drought/disaster management and food security). The process is illustrated by recent technical assistance activities in Asia.

NESDIS/AISC, AID/OFDA, and the UN/Economic and Social Commission for Asia and the Pacific (ESCAP) have worked jointly to improve drought/disaster early warning in South and Southeast Asia. Recently, they organized the Joint Seminar on Agroclimatic Models and the Assessment of Drought-Related Food Shortages, held in Bangkok, Thailand, January 24-27, 1984. Policymakers (National Food Security Management, Ministry of Agriculture, and National Meteorological Service) from nine countries learned how operational weather information can contribute to improved short-term economic decision making (imports, prices and marketing) and drought/disaster preparedness and early warning. Decision makers also developed country plans to implement national climatic impact assessment programs during 1984. Participating countries included ASEAN members (Indonesia, Malaysia, the Philippines, and Thailand) and the South Asian countries of Bangladesh, India, Nepal, Pakistan, and Sri Lanka.

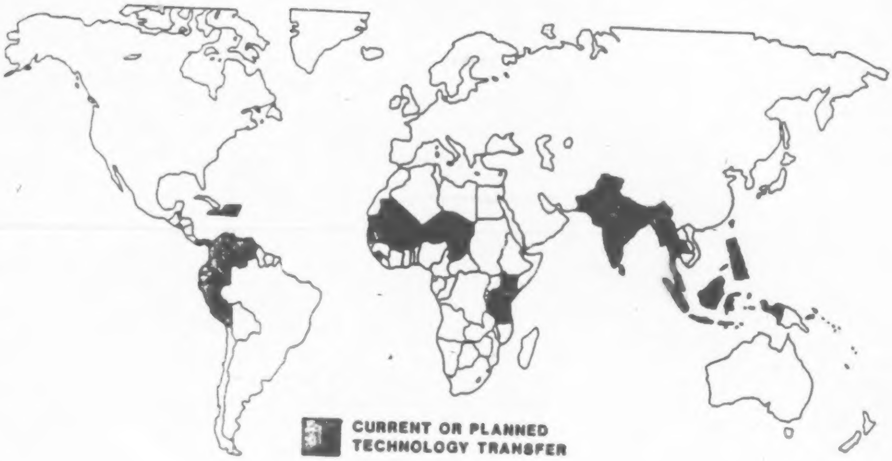
Technical training focuses on how to develop, prepare and distribute assessment reports. Qualified scientists develop an assessment capability appropriate for the mission of their agency, i.e., meteorologists (drought monitoring and climatic analysis), statisticians (crop production forecasting) and agricultural economists (economic analysis and policy recommendations).

Three types of training are provided: U.S. based intensive six to eight week training courses, two week courses within the region and follow-up "on-the-job" training in-country. A key component of the training includes inexpensive micro-computer technology with "user friendly" software and data which provide the scientists with the capability to develop and use models, particularly when they return home.

In contrast to the regional technical assistance for Asia, AISC also assists host-countries in developing long-term projects with AID. For example, the Government of Peru recently began publishing national assessment bulletins through such a project. In Ecuador, AISC helped design a project which will not only focus on crop condition assessments, but also on weather advisories for farmers (e.g., irrigation scheduling and frost mitigation), land and water resources management (increasing crop production), and their technical assistance for the public and private sectors.

Figure 4

PROGRAM SCOPE
TECHNOLOGY TRANSFER
NOAA/NESDIS/AISC


▨ CURRENT OR PLANNED TECHNOLOGY TRANSFER

NEW INITIATIVES

AISC is seeking to improve disaster preparedness and early warning programs by simultaneously upgrading the current climatic impact assessment program and expanding the technical assistance to developing countries in support of AID agriculture and rural development objectives. This will be accomplished by:

- o introducing improved drought/potential food shortage assessment tools which will further increase the timeliness, reliability, quantification and use of the existing AISC assessments,
- o expanding the agroclimatic/potential food shortage assessments to drought-prone countries of Equatorial West Africa and the Middle East, and
- o providing continued technical assistance to current project countries in Latin America and Asia while expanding the program to Africa and the Carribean Basin.

Assessments will be upgraded by introducing meteorological satellite technology, global climatic analysis, and economic modeling applications. Daily satellite data will be used for: 1) improving the assessment of daily rainfall, particularly in remote, data-sparse regions or at locations with unreliable and incomplete rainfall reporting and 2) monitoring crop conditions for evidence of moisture stress and standing water reserves potentially available for irrigation. The reliability and quantification of crop condition/potential food shortage assessments will be increased by this independent, direct read-out of vegetation conditions available through NOAA weather satellites. A second type of independent drought/potential food shortage index to be introduced has been developed from ongoing climatic research programs on tropical circulation patterns and their association with drought. Econoclimatic models will be developed for semi-arid regions in the Sahel, Eastern Africa, and Southeast Asia. These can be used to provide US/AID Missions with recommended management strategies for the potential mitigation of ongoing climatic impact.

CONCLUSIONS

The NOAA/NESDIS Assessment and Information Service Center has successfully demonstrated that operational climatic impact assessment technology contributes to improved food security in developing countries. This cost-effective technology can "save lives and money." With support from AID, AISC is helping developing countries implement their own national programs. In addition to making immediate contributions to short-term economic decision making, the technology can improve long-term development programs, for example, by helping to increase crop production to achieve food self-sufficiency.

A NEW METHOD OF INCORPORATING METEOROLOGICAL SATELLITE DATA INTO GLOBAL CROP MONITORING*

Russell A. Ambroziak

Climate Impact Assessment Division/AISC/NESDIS/NOAA
3300 Whitehaven Street NW
Washington, DC, USA 20235

ABSTRACT

An inexpensive and effective method of monitoring vegetation using NOAA/AVHRR satellite data is presented as an integral part of a global crop monitoring system. The satellite monitoring subsystem increases the value of the meteorological and agronomical subsystems, but cannot stand alone as an assessment system. The satellite monitoring subsystem is based on a new color coordinate system which maximizes the information content of satellite images and minimizes the analysis time. The color coordinate system is described and compared to other systems.

1. BACKGROUND

Drought Early Warning System

As part of the Agency for International Development's Office of Foreign Disaster Assistance (AID/OFDA) disaster preparedness program, the National Oceanic and Atmospheric Administration (NOAA) has developed a drought early warning system for food crops in the tropics. The system provides routine operational drought impact assessments to US Embassies and AID missions in five tropical regions -- Africa, South Asia, Southeast Asia, Central and South America, and the Pacific Islands.

As would be expected, the drought early warning system is based on the detection of below normal rainfall during the growing season. To do the job several types of information are required, for no single data system can provide the complete answer to the question of food production. Operational production of the assessments is a key factor in the success of the project. Operational assessments provide a focus for the system development, serve as a test of new techniques, and provide an important check on the cost of the new assessment tools. Resource limitations are a very real constraint and must be used to judge any new assessment tool.

The detection of drought is not as simple as it may appear. Both the estimation of rainfall and the determination of drought, once the rainfall is known, are complex problems. Estimation of the rainfall over a large area is complicated enough, but once the rainfall amount is known for an area there remains the problem of determining whether or not there is a drought. There is no definition for the onset of drought. Drought is a direction, not a location. The word drought can be compared to the use of the word cold. There is no set temperature at which something is cold, rather cold is a direction which is the opposite of warm. Drought is the opposite of wet, but there is no one point on any drought scale which marks the beginning of a drought.

---

*Presented at the Eighteenth International Symposium on Remote Sensing of Environment, Paris, France, October 1-5, 1984.

Multiple Subsystems

Other information must be combined with the weather data to determine both the amount of rainfall and the status of drought. Satellite data provide additional rainfall information and agronomic, climatic, economic, and political data help detect the onset of drought in each region. All of these data sources form the basis for subsystems which must be combined to produce the best possible operational, early warning assessments of drought. The major subsystems in the program are agricultural, climate, and satellite.

The agricultural subsystem is the starting point for evaluating the impact of climate on crop production. Included in the agricultural system are farming practices, the geographic distribution of crops, plant phenology (timing of the stages of plant development), physiology, economics and, in some cases, politics. No assessment is possible without knowing where the various crops are grown and how they are grown, but that is not the complete picture. It is necessary to understand how various crops in different stages react to the weather conditions and how weather conditions control crop stage. Other information that is important is the amount of fertilizer used, and the political stability of the region as it affects the demand for food and the supply of farm labor.

The weather and climate subsystem provides the all-important rainfall data, and is composed of rainfall reports from rain gauge measurements, the evaluation of large scale weather systems, and the climatology of the regions. Available rainfall reports are sparse in many tropical regions. Even in areas where dense reporting networks are in place, these data are frequently not transmitted to the international scientific community in real time. When station reports of current weather are available, rainfall amounts are the least important of all the reported elements and are, therefore, the least reliable. Rainfall amounts have no use in aviation and are of limited use to weather forecasting, the two major uses of transmitted weather data. Moreover, if the weather reports did contain completely accurate information they would not tell the whole story because rainfall is not a continuous parameter. When the majority of the rainfall comes in the form of showers, as it does in the tropics, rainfall amounts differ widely over short distances. A single rain gauge may be a poor estimator of rainfall over a large area.

Large-scale pressure patterns and the climatology of each region must be analyzed with the rainfall reports to remove errors in the data and produce accurate large-area rainfall estimates. These analyses are subjective and require years of training and experience. A valuable addition to the solution of the rainfall measurement problem has been meteorological satellite (met-sat) data.

2. SATELLITE SUBSYSTEM

Rainfall Estimation

If clouds are absent over a region during the rainy season, there is a drought in that region. This simple fact allows for the use of met-sat data to determine the large area rainfall amounts from an independent data source. NOAA met-sat data covers the world twice a day and can determine where it is not raining on each pass. Moreover, a trained technician looking at the met-sat images can identify cloud types which have a high chance of producing rainfall. An estimate of monthly rainfall for the region can be computed by totaling the daily percentage coverage of rain-producing clouds. The units of these estimates are in millimeters of rainfall, but they are more accurately thought of as probabilities of drought. When estimates are low, the cloud cover has been below normal and rainfall is certainly less than normal.

Computer analysis of the brightness of each picture element (pixel) can be used to automate the system and produce global assessments of drought probability from both current data and historic data sets. This system should not be confused with other met-sat based rainfall estimation systems which produce point specific rainfall estimates on a daily basis. These systems require a great deal more data and are much more complex. The result is an increase in cost of a factor of 100 or more. Resource limitations prevent systems of this type from being used to monitor the globe in an operational mode. Crop assessment does not require this degree of accuracy, and the simpler mean monthly cloud measurement system is both sufficient for the assessment process and affordable.

Surface Monitoring

There is general agreement that met-sat data contain valuable information about the status of the crop, but existing systems either do not work very well, they are extremely expensive to operate, or both. What is needed is an inexpensive system which will provide useful information over large areas in the tropics. The solution is to do qualitative analysis to remove the need for atmospheric corrections, which accounts for most of the analytical difficulties and costs, and to use low resolution data to reduce storage and processing costs.

Resolution has been one of the most serious problems in satellite monitoring of vegetation over the past several years -- there has been too much of it. For many applications, increased resolution does little more than geometrically increase the cost of analysis. Large-scale crop monitoring requires large-scale analysis, and every application of satellite monitoring requires as complete a data set as possible. The trick is to get a complete data set that is small enough to analyze and store. Once the complete data base is in place, higher resolution data can be included as subsets of the low resolution data set, and the low resolution data can be used to put the higher resolution data into context.

Any data base which requires more than a computer tape per week to store its data quickly looses its flexibility. Processing real time data becomes a full time job for someone, storage and retrieval quickly become a problem, and processing historical data becomes a chore which must be scheduled weeks in advance. In short, the responsiveness of the system to innovative analysis and development of new assessment tools drops dramatically.

The size of the data base is a function of both the spatial and temporal resolution. Met-sat data for crop monitoring is available daily for the entire world. A week of these data can be stored on a single computer tape if the spatial resolution is of the order of 20 kilometers. A polar stereographic (PSG) grid measuring 1024 by 1024 pixels meets the resolution requirement and serves as the primary data base for this project. This resolution allows an entire continent to be displayed on a standard image processor as a single image. This resolution is sufficient to monitor the general crop status of several hundred crop regions in the tropics.

Qualitative Analysis

All satellite data should be thought of as qualitative data, and any system that treats it as quantitative introduces problems that are difficult if not impossible to solve. If the satellite was bolted to a stable platform a few meters from the crop, looked at the crop at the same angle on each acquisition, and the light source was constrained in the same way, then these data could be considered to be quantitative. For example, a reading of 12 for channel I and a reading of 30 for channel II could be used as a specific measure of biomass of the plant being measured. If the sensors on the satellite were looking straight down through a vacuum, these data could also be used quantitatively. However, these data become qualitative when the gases, liquids, and particulates of the atmosphere interact with the sun's radiation, the viewing angle is constantly changing, and the sensors in the satellite drift.

Any system which attempts to remove the effects of the atmosphere and make these qualitative data into quantitative data must be expensive and will likely not succeed completely. All of the gases and particulates that cause radiation to change as it passes through and bounces off of parts of the atmosphere vary over time and space in a very complex manner. To remove the effect of these contaminants a complex, dynamic model of the atmosphere and detailed particulate measurements must be combined and run for the entire globe, and results returned for each pixel as a function of look angle. The cost of such a model would be prohibitive if it existed, and neither the model nor the particulate data exist at the scale needed.

Much simpler models can be designed to remove some of the noise caused by the atmosphere, but to a large degree the data remain qualitative. By qualitative we mean that the exact value of any measurement from a satellite is not the same as it would be if taken from the surface, but the relative values of adjacent pixels will remain in the same relative position regardless of the atmosphere. If the measurement from pixel 1 is greater than that from pixel 2, it will remain greater, or become the same under complete cloud cover, but it will never become less. The absolute value of each may increase or decrease by some amount, their ratio may change, and the difference between them may change, but their positions will not reverse.

To the physical scientist it may seem that all of the value of the information is lost if only the relative values remain. This is because the physical scientist has been trained to work with quantitative data. These data contain noise, but the underlying values are quantitative -- a 12 may be hard to measure, but when it is measured it will be a 12. Since physical scientists are the people who do this analysis, the first step has always been to remove the noise caused by the atmosphere. If this cannot be done economically, an expensive and ineffective product usually results.

There is one processor that, by design, processes only qualitative data, and actually cannot process quantitative data -- the human mind. Images seen by the eye are transmitted to the brain as relative patterns at the expense of quantitative measurement. How this is done is only now beginning to be understood, but the reason for it is simple. Lighting and viewing conditions are constantly changing in nature, just as the atmosphere is changing for the satellite. The time of day changes the sun angle and shadows, clouds and other objects reflect the sun, fog dust and haze are frequently present, and the light source may be the moon or a fire rather than the sun. If our distant ancestors had been required to store in their brains separate information for each scene under every possible lighting and viewing condition, we would not be here today. By the time a threat to life or to a source of food would have been recognized the poor creature would have died from attack or starvation. In any case, a brain that could store this much information probably could not be carried by the body it served, so a better solution was needed.

The solution was to store only the general pattern as discerned by relative differences between the background and the pattern of interest. There are a number of optical illusions which amaze people who do not realize that the mind cannot quantify. An illusion which best illustrates this fact and serves to explain why the color system proposed below works is a simple color chart in a paint store. These charts normally are made up of adjacent squares of different colors called paint chips. If the colors are very different, such as bright red, green, or blue, the mind sees them as they are. If, however, the color or brightness change is small, as in subtle shades of pink, the mind enhances the difference to make the change more noticeable. The result is the appearance of sharp borders between the color chips and an apparent reverse gradient across the chip. If the surrounding colors are covered by a mask, the illusion disappears, but returns when the mask is removed. There is no way to defeat this illusion, and the color coordinate discussed below uses this talent to analyze images for crop vigor.

Photo Interpretation

Nothing that has been said so far has been news to the photo interpreter (PI), but some of it probably was to the image analyst who has been trained as a physicist and has had no PI training. The solution that is presented here is simply to use what we know about the physics of the situation to produce an image that makes it as easy as possible for a PI to see how the vegetation is doing while reducing the possibility of confusion by the atmosphere. This is not as difficult as it sounds, because there is a big difference between confusion and annoyance. Clouds, for example, have distinctive patterns which are easily identified as clouds in an image. The presence of clouds is an annoyance to a PI, since they block the surface, but they do not confuse because they are seen for what they are and they are not confused with surface features.

If the scene is correctly displayed to minimize the confusion and maximize the wanted information, it is fairly easy to train people who are familiar with the situation to use the satellite data to enhance their understanding of what is happening on the ground. This is a key point. If satellite data are used qualitatively, they must be combined with other data to produce quantitative answers. These other data include recent weather, climatology, cropping practices, and economics. These data are quantitative, but they are usually coarse in their spatial and temporal distribution. The satellite data can be used to interpolate these data, to make gross value checks, and to fill in data gaps.

False Color IR

There is already a system in use which fulfills the requirement of minimized confusion. The system has been used for aerial photography, Landsat, and NOAA AVHRR crop condition assessments with some success by trained PI's. This system is the false color IR (FCIR) color coordinate system which is based on the shifting of the blue, green, and red towards the IR to accommodate the near IR channel (figure 2). Color film uses red, green and blue to reproduce all of the colors in a scene. The system works because these are the same as the receptors the eye uses to sense color. With the addition of the reflected IR light, one of the colors had to be dropped to make room for it. Since Rayleigh scattering produces a blue haze on color photographs taken from high altitude, the blue light was the band that was dropped. In this system green becomes blue, red becomes green and near IR is red.

The FCIR system is extremely useful for identifying vegetation because of a convenient accident of color coordinate system alignment. Quite by accident the mind's natural color coordinate system is aligned with the most commonly used vegetative indexes. The result is an image that contains all the useful information contained in the original data that is displayed in a way that the mind can directly evaluate a biomass as changes in color. These color changes are not arbitrary. They are seen by the mind as changes on a single orthogonal axis and patterns of biomass can easily be detected.

All studies of Landsat and AVHRR that have attempted to produce a single number (index) to describe the health of vegetation have begun with the difference between, or the ratio of, the near IR channel and one of the visible channels. One of the most common indexes is the difference divided by the sum, which is called the "normalized" difference vegetative index. It is this index that is displayed as changes in saturation in the FCIR coordinate system (figure 1).

This must be an accident because the FCIR system is a red, blue, green (RGB) display not an intensity, hue, saturation (IHS) display. The difference between these two coordinate systems is extremely important because, although the eye receives RGB information, the mind processes only

IHS information. The net result is that patterns of RGB in an image are totally invisible to a PI while IHS patterns are easy to detect.

For crop monitoring an FCIR display is basically a two channel RGB display of one visible and the near IR channel. The earth's surface shows relatively little change between the visible channels but shows dramatic variation between any of the visible channels and the near IR. To produce the FCIR display the brightness of the red gun in the CRT is controlled by the value of the IR channel, and blue and green are equal (or nearly equal in the case of three channel Landsat) and controlled by the visible channel. The result is a red and cyan (blue-green) display with natural brightness that is directly related to the "normalized" index values. Positive values (increasing biomass) are displayed as red, and negative values (water) are displayed as cyan. Where the two are equal the color is white or gray. Everything that is neither water nor vegetation lies along or very near this diagonal. The values of saturation computed from these colors are exactly equal to the index values. For example an index of 0.60 is displayed as a pink which is 60 percent saturated red.

Since changes in saturation of red are equal to changes in the vegetative index it is easy for a PI to make qualitative comparisons of the state of the vegetation on the ground -- the redder the better. This coordinate system has been in use for many years to discern features in the pattern of vegetative health. It is still the most useful, generally available method of analyzing imagery but it does have a serious flaw. The subtle changes in saturation may be sufficient to detect patterns, but they are too subtle to make any comparisons between points that are not adjacent. One of the reasons is the false gradient the mind creates when color change is too subtle to see easily. The other is that of the three axes of the IHS the saturation is the one with the worst resolution. Both intensity and hue are much easier to separate than saturation.

Arbitrary Index Coloring

There is a system that solves the problem of comparing non-adjacent colors, though it creates a set of its own problems. To understand the final system, which is what all of this is leading up to, we must understand this arbitrary index color system. The arbitrary index color system is at the opposite end of the coordinate system spectrum from the FCIR system. The Ambroziak color coordinate system will be shown below to be a combination of both of these systems.

The arbitrary index color system uses few colors. They are chosen to be as different from each other as possible so that they can be uniquely identified (figure 3). A narrow range of positive index values corresponds to each color except blue, which is assigned to negative values to denote water. This coordinate system shows sharp, easily identified boundaries and serves as a quantitative contour map of positive index values. It is an ideal presentation of the index, and if the effects of the atmosphere have been removed, it is the preferred method of displaying the index.

The arbitrary index color system, however, does not display all of the information contained in the original two-channel data, nor does it present a continuum that allows the relative comparisons that the mind does so well. It may be great for display, but it is a poor analysis tool. Dark soil, light sand and clouds all have the same index value and will appear the same in the arbitrary index color system. If brightness is included, the data loss problem is solved, but the lack of a continuum remains.

3. AMBROZIAK COLOR COORDINATE SYSTEMS

The natural first step toward improving the FCIR system is to replace the poorly resolved saturation with hue. The perceptual difference between red and orange (hue) is much greater than between red and reddish pink (saturation). The first Ambroziak color coordinate system (ACCS) assigned green to an index value of 1, red to 0, and blue to -1 (figure 4). The result is a fairly natural looking scene with green vegetation, dark blue water, red and brown soils, and yellow stressed vegetation.

Clouds are bright red in this scheme which is annoying to the analyst. To remedy this problem, saturation is reduced to zero for the very high visible brightness values. Should a cloud filter become available, such as thermal detection, these data would be used to reduce saturation in a more efficient way. The presence of thin clouds or haze in a natural scene is discerned as a reduction in saturation. By making this change to the coordinate system the image takes on a more natural appearance.

This system proved to be extremely useful in monitoring the status of vegetation in the tropics during the northern hemisphere summer of 84. Test reports produced from only the images agreed closely with assessments produced from all other data sources. Patterns of drought and plentiful rainfall were shown in finer detail than was possible with the station data alone.

Assessors determined that the ACCS is a significant improvement over the FCIR system, but that it lacked the comparison of distant points capability of the arbitrary index color system. A step toward this goal is achieved by cycling the hues at twice the rate of that used on the ACCS. The result is the ACCS2 which assigns green to an index value of 1, red to 0.5, blue to 0, cyan to -0.5, and green again to -1 (figure 5). There is little or no chance for confusion between the two greens because all values below -0.5 are very dark and appear black on the image.

The ACCS2 is close to the arbitrary index color system in its color separation ability, yet it maintains all of the advantages of the FCIR system, making it an ideal tool for analysis. The ACCS2 images do not have the natural appearance of the ACCS, but this is of no concern to the analyst using them. Comparisons of cumulative rainfall and the images shows close agreement between the index and point station values of rainfall. By using the two data sets, detailed maps of cumulative rainfall can be produced. Other uses for the system are now under development.

Other Uses

The ACCS's have no dependence on AVHRR data and have been demonstrated to be useful in viewing Landsat images as well. Aerial photography can be digitized through filters and also can be converted to one of the ACCS's. These higher resolution data can be combined with the lower spatial resolution AVHRR to produce a more valuable data set than either alone. The AVHRR data has high temporal resolution and provides a complete overview data set. The higher resolution data can provide detailed closeups of areas determined to be of interest from analyzing the AVHRR.

To analyze the world the 20 km resolution sampled AVHRR data is a reasonable size, but if a single country or small region is the subject of the analysis then the 1 km resolution local area coverage (LAC) or high resolution picture transmission (HRPT) data would serve as the basic data set. In this case Landsat and aerial photography would provide the closeup views of the region.

The basic data set provides a complete record of historic data from the date acquisition begins. This data set becomes not only a valuable and inexpensive research tool, but it increases the value and decreases the cost of the higher resolution imagery. The value of the higher resolution imagery is increased by putting it into time and space context. The cost is reduced because less high resolution imagery is needed, that which is obtained contains important information, and cloud contaminated scenes can be avoided.

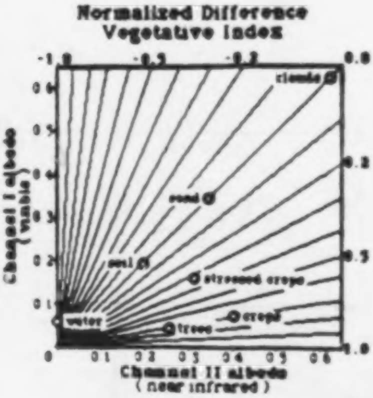


Figure 1

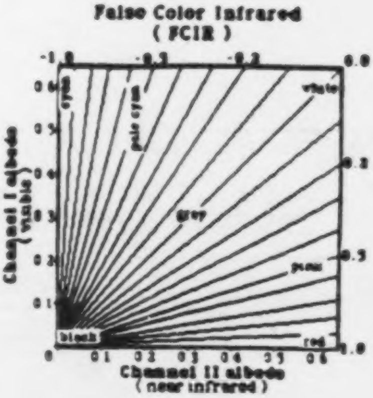


Figure 2

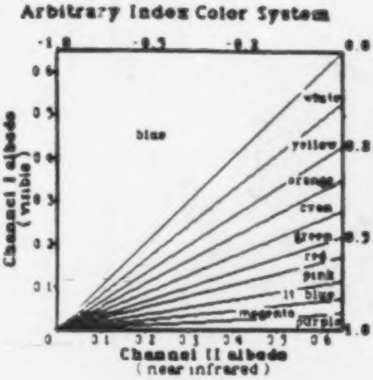
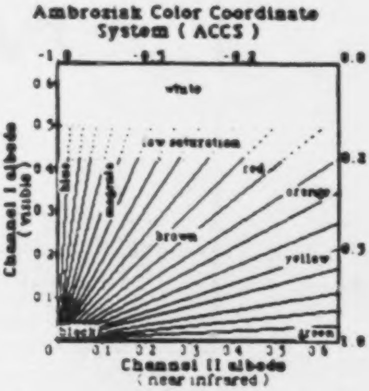


Figure 3



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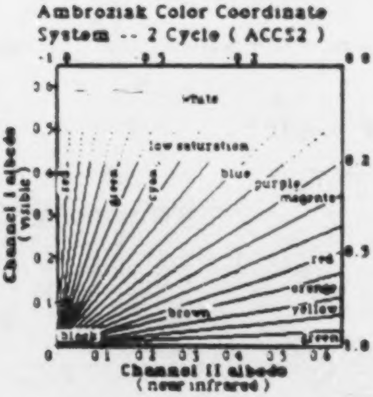


Figure 5

ABBREVIATED REPORT

FULL REPORT IN COMMITTEE FILES

SPECIAL CLIMATE IMPACT ASSESSMENT
SUB-SAHARAN AFRICA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE (NESDIS)
ASSESSMENT AND INFORMATION SERVICES CENTER (AISC)

PREPARED IN SUPPORT OF THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

MAY - JULY 1985

ISSUED ON AUGUST 9, 1985 VOLUME I, NUMBER 2

CONTENTS

Page

Introduction i

Regional Analysis 1

Background on Assessment Methods 8

Country Analyses 11

  Cape Verde Islands Assessment 12

  Senegal Assessment 13

  Gambia Assessment 19

  Mauritania Assessment 25

  Mali Assessment 31

  Burkina Faso Assessment 37

  Niger Assessment 43

  Chad Assessment 49

  Sudan Assessment 53

  Ethiopia Assessment 57

  Somalia Assessment 63

INTRODUCTION

This is the second in a series of monthly Climatic Impact Assessment Reports issued for the Sahel/Horn countries of Africa during the crop growing season by the NOAA/NESDIS Assessment and Information Services Center (AISC). These special reports are based on state-of-the-art techniques to: (1) use daily meteorological satellite and weather station data for determining rainfall patterns and vegetation/biomass conditions, (2) detect drought and assess weather impacts on agriculture, and (3) present this information in a format that is useful for both non-technical and technical users. They are part of a USAID sponsored program designed to significantly improve the capability of the Sahelian countries, Sudan, Somalia and Ethiopia to assess the impact of weather on agriculture (food crops and rangeland) and use the assessments as input for decision making.

These reports are intended to provide advanced warning of drought induced crop failures and should facilitate early planning for food crisis amelioration and drought/famine relief.

The special assessments, which are air-expressed or hand-carried to U.S. Missions in the field, contain satellite images, narrative analyses of all pertinent data, crop and rangeland maps, and various tables and maps depicting weather impacts on agriculture and containing rainfall statistics.

Rainfall amounts used in these reports are preliminary estimates and may vary greatly from values published elsewhere. The quality of the data received via the WMO Global Telecommunications System (GTS) ranges from good in Senegal, Burkina, and Niger to non-existent in Chad and Sudan. Rainfall data from Somalia, Gambia, and Cape Verde are extremely scarce. Data from Mali, Mauritania, and Ethiopia range from fair to poor. Satellite cloud imagery from Meteosat is used to estimate rainfall where surface reports are missing or appear inaccurate or unrepresentative. Satellite vegetation images from NOAA-9 are used to further adjust the rainfall data. The term "normal rainfall" generally refers to 1951-83 mean rainfall. Readers should keep in mind that rainfall amounts have averaged 15 to 25 percent less since the late 1960's in the Sahel zone.

The AISC Special Assessment Reports will be updated every 10 days by cable. Assessment of quantified weather impacts on 1985 millet and sorghum yields (by major administrative region) will be provided by cable about August 20, 1985. AISC's quantified assessments focus only on weather factors affecting yield, not such non-weather factors as seed availability for planting, losses due to pests/diseases, affects of fertilizer, or farmer's decisions which determine planted area or shifts from one crop to another. Such information can best be determined in the field.

This assessment represents the synthesis and evaluation of all available data. Although some of the pertinent input data are included for use by other analysts, all data sets are modified in some way by AISC and no single data set can be used alone. Apparent discrepancies between data sets or between the enclosed data and the analysis can result from the analysis process, which combines all data and analyst experience to produce the best possible assessment.

AISC welcomes comments or suggestions on these reports. Feedback from U.S. Missions is appreciated and has already helped to improve this assessment service. Contact: Douglas LeComte E/AI42, NOAA/NESDIS/AISC, Page Bldg. #2, Room 130, 3300 Whitehaven St., NW, Washington, D.C. 20235, Phone (202) 634-1822.

REGIONAL ANALYSIS

OVERVIEW

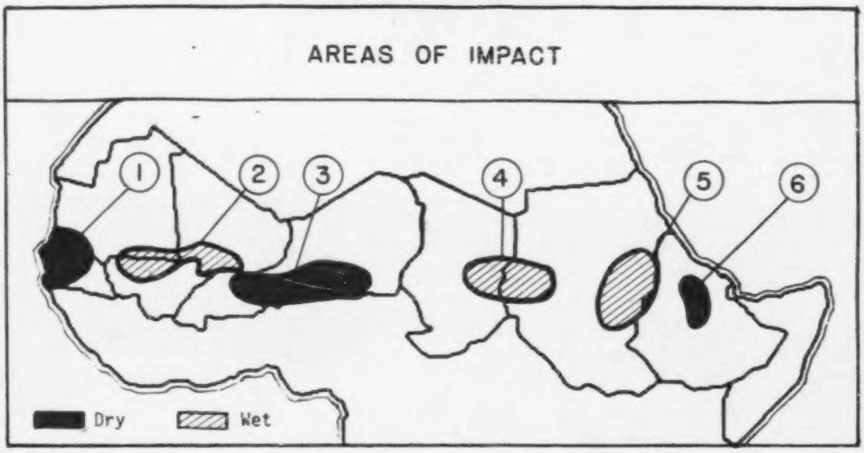


Figure 1

Crop and pasture conditions are much improved over the previous two years across the Sahel/Horn region, as July rainfall helped to offset earlier dryness. Normal to above-normal rainfall in Chad, Mali, Burkina Faso, and Sudan hampered food relief efforts but increased crop yield potential, suggesting an easing of food shortages late this year. Pasture conditions throughout the region improved markedly from June, though they remain below normal in Niger, Senegal, and Gambia. Crop conditions are normal to above normal in Mali, Burkina, Chad, and Sudan. Conditions in Mauritania, Senegal, Gambia (fig. 1, No. 1), and Cape Verde are somewhat unfavorable due to a late beginning of the rainy season, but plentiful rainfall throughout the remainder of the season would produce average crop yields. In Ethiopia, heavy rains have benefitted crops in western areas, but more rain may be needed in some central and northern areas (fig. 1, No. 6). Overall rainfall across the Sahel/Horn region (fig. 3) ranges from 80 to 120 percent of the long-term mean so far this year, except for parts of Niger, Senegal, Gambia, and Mauritania, where rainfall is 60 to 80 percent normal. The Intertropical Discontinuity (fig. 2) was south of normal in April and May, accounting for the slow start of the rainy season in West Africa. During July, the ITD moved sharply northward to the 20th parallel, bringing much heavier rains to the region compared to last year. The ITD remained south of normal throughout the important growing period in 1984, resulting in one of the worst droughts this century.

The following paragraphs briefly describe areas highlighted in figure 1. Note that 1984's AVHRR image (fig. 5) has a 20-km resolution, whereas the 1985 image (Global Area Coverage, or "GAC") has a 5-km resolution. GAC coverage is not available for last year.

Area 1. In Senegal, Gambia, and adjacent areas of Mauritania, below normal June rainfall delayed planting to some extent, but near normal July rainfall improved prospects in most areas. Satellite indices (fig. 4) and imagery (fig. 6) suggest unfavorable biomass conditions, except in extreme southeast Senegal. Cloud "contamination" makes this year's image in figure 6 difficult to interpret, but "greening" appears to be farther north in the 1984 image (fig. 5).

Area 2. The 1985 satellite image (fig. 6) shows a marked improvement in biomass in Sahelian areas of Mali and adjacent areas in Mauritania compared with last month. Note, especially, the bright yellow hue along the Mali-Mauritania border.

Area 3. Overall crop and livestock prospects remain below average in Niger, though better than last year. Higher rainfall and lower temperatures in July boosted cereal and pasture growth following hot, dry weather in June.

Area 4. Normal to excessive rains interfered with surface transport of relief aid to drought victims in Chad and Sudan, though the moisture should ensure improved crop production this year (subject to availability of seeds). Heavy showers damaged roads in Sudan's Darfur province, hindering food supplies shipped by truck.

Area 5. Satellite data show substantial biomass improvement this year in eastern Sudan (figs. 4, 5 and 6), where the bulk of the country's cereals are grown. Crop yields should be much greater than 1984's drought-reduced levels.

Area 6. Abundant rains have favored main season crops over much of Ethiopia, especially in the west, but satellite biomass conditions do not appear good in parts of Wollo and Tigray in the north, as well as Shoa and Sidamo in the center. Cloud "contamination" may be a problem in interpreting the image. This area should be monitored closely for signs of dryness in August.

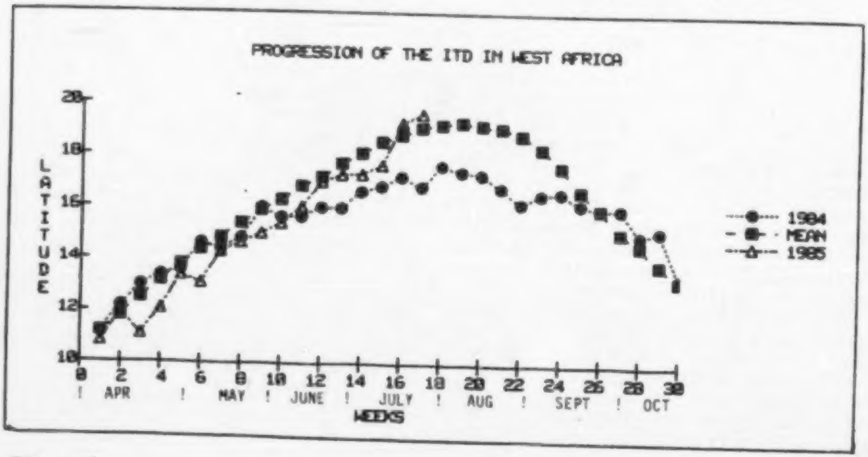


Figure 2

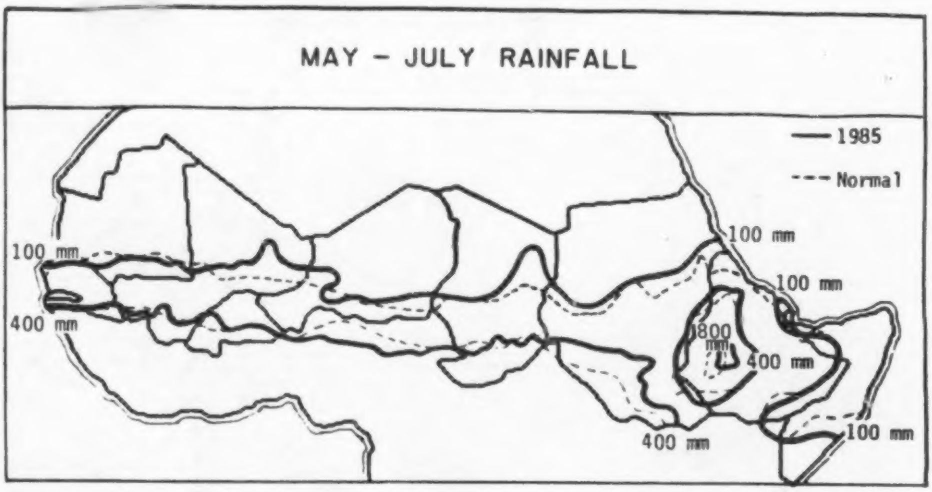

MAY - JULY RAINFALL
— 1985
--- Normal
100 mm
400 mm
100 mm
100 mm
800 mm
400 mm
400 mm
100 mm

Figure 3

The northern edge of the rains (100 mm isoline) was south of normal in Mauritania, but north of normal in Mali, parts of Niger, eastern Chad, and Sudan. Heavier rains (400 mm) were north of normal in southwest Burkina and southern Sudan.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA

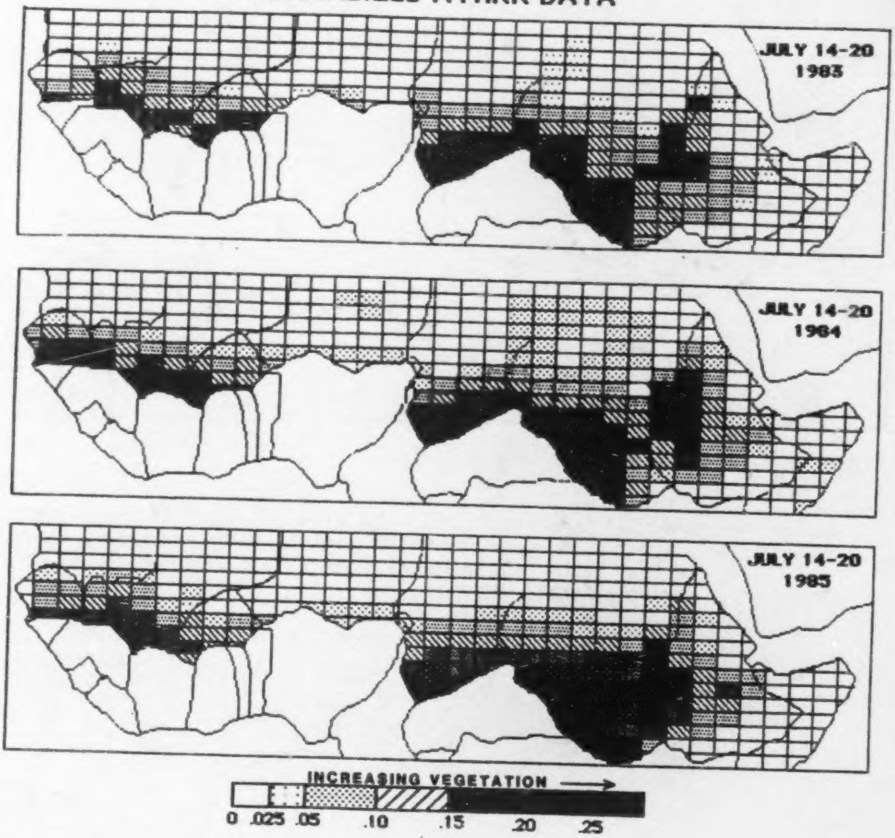

JULY 14-20
1983
JULY 14-20
1984
JULY 14-20
1985
INCREASING VEGETATION →
0
.025
.05
.10
.15
.20
.25

Figure 4

NOAA AVHRR IMAGE 1984

Figure 5

NOAA AVHRR IMAGE 1985

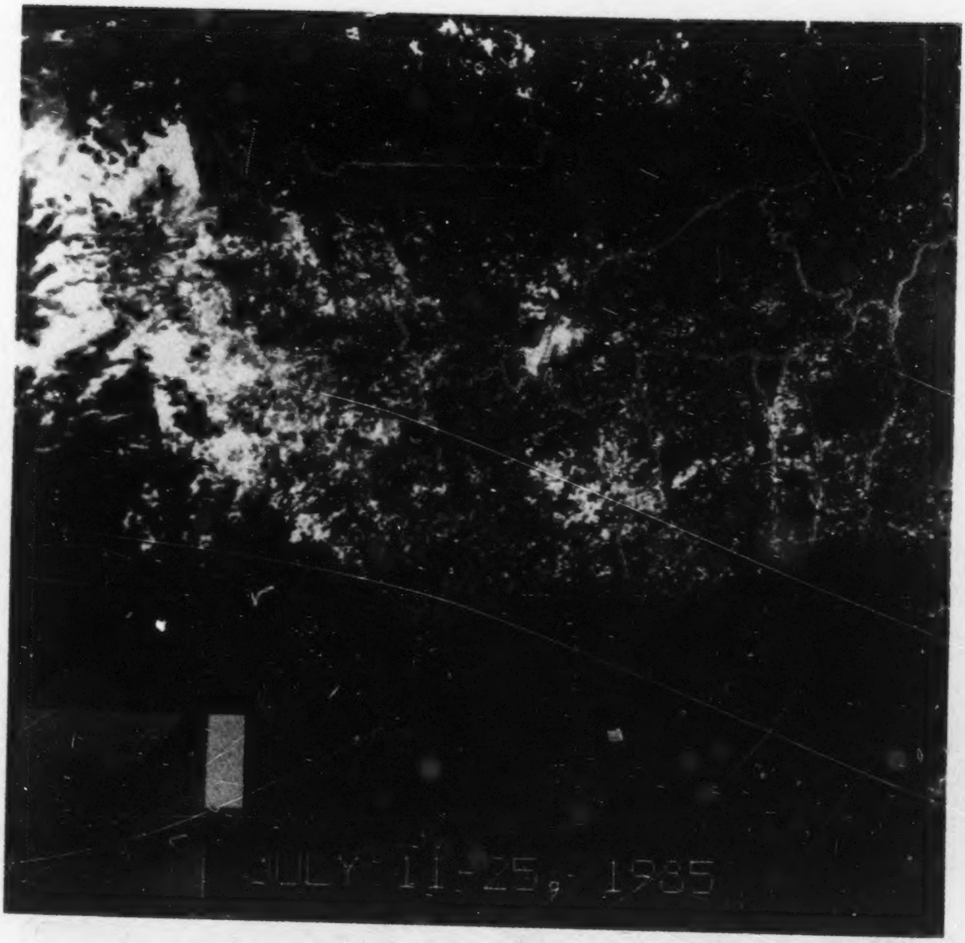

JULY 11-25, 1985

Figure 6

BACKGROUND ON ASSESSMENT METHODS

DATA

The NOAA/NESDIS Assessment and Information Services Center (AISC) uses a combination of meteorological satellite products and weather data as the primary inputs for these Special Climatic Impact Assessments. Operational rainfall reports are received daily through the WMO Global Telecommunications System (GTS) and ten day reports are received from some host-countries and the Regional AGRHYMET Center in Niamey. AISC uses data from ESA's Geo-stationary Meteorological Satellite (METEOSAT) and the NOAA-9 daily polar orbiting satellite. METEOSAT photographs are used as one method to assess regional rainfall and to monitor large-scale weather patterns, e.g., the Inter-tropical Discontinuity (ITD). NOAA-9 data are used to assess vegetation/biomass patterns and to estimate rainfall.

NOAA SATELLITE ANALYSIS

The NOAA satellite provides daily data from the Advanced Very High Resolution Radiometer (AVHRR) which has a spatial resolution of one kilometer. The satellite receives radiation signals (e.g., from the ground and clouds) and immediately re-transmits one kilometer resolution data which can be received by local field stations as the satellite passes in the vicinity. The satellite can also record a limited amount of the one kilometer data; recorded data are termed LAC for Local Area Coverage. As they are received, the one kilometer radiation signals are sampled to obtain four kilometer resolution data (termed GAC for Global Area Coverage) which is stored internally.

The NOAA satellite products for 1985 in these special assessments are primarily based on 1985 GAC data (as available, AISC will include special LAC scenes). The 1984 and 1983 satellite images have a more coarse resolution on the order of 20 kilometers. Although these images have larger pixels, users can still compare 1985 conditions with those of previous years.

AISC obtains daily four kilometer resolution GAC data consisting of three radiation channels: Channel I (visible reflected solar radiation), Channel II (near infrared reflected solar radiation) and Channel IV (thermal infrared radiation). These three channels are composited over 10-15 day periods to remove most of the clouds from the image and produce the color-coded NOAA satellite images and vegetation/biomass index products contained in this report.

NOAA Satellite Images

The Ambroziak Color Coordinate System (ACCS), used to produce the satellite images in this assessment, shows the health of the vegetation using colors designed to maximize the information content and minimize the analysis time. Different hues (red-orange-yellow-green-cyan-blue) separate vegetation and water from soil and clouds using the visible and the infrared portions of the sunlight reflected from the surface. Saturation (red-pink-white) is used to identify clouds using the emitted thermal infrared radiation. Clouds are usually colder than the surface and they become white when the saturation of the colors is reduced for pixels with low temperatures.

The colors of the ACCS display a continuum of hue and intensity which matches both the data and the mind's perception system. Sharp boundaries on the image, shown as large changes in hue, indicate actual sharp changes in surface vegetation. The colors can be generally interpreted as follows:

HUE	INTENSITY	
	Dark	Bright
red	wet or dark soil*	sand or low clouds
yellow	emerging or sparse plant cover over wet or dark soil*	emerging or sparse plant cover over sand or under scattered clouds
green	very healthy plants combined with standing water or forest	healthy field crops or similar plants
cyan (greenish-blue)	dense forest	dense forest, maize, or rice cover
magenta (purplish-red)	clear shallow or slightly turbid water	highly turbid, very shallow, or partially cloud covered water

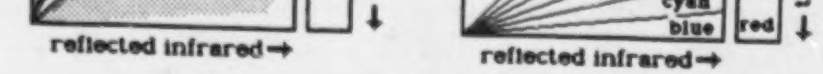
COLORS WITHOUT HUE

black	clear deep water or dark shadow
white	clouds, snow, or colder high terrain

*Dark reds, oranges, and yellows are shades of brown.

Ambroziak Color Coordinate System

colors and meanings


visible light →
clouds
sand
soil
water
plants
reflected infrared →
cold →
← warm
← thermal infrared
visible light →
magenta
red
orange
yellow
green
cyan
blue
reflected infrared →
white
cold →
← warm
red
← thermal infrared

Vegetation/Biomass Index Products

The Vegetation/Biomass Index products contained in this assessment are derived from the following formula:

$$\text{NVI} = \frac{\text{Channel II} - \text{Channel I}}{\text{Channel II} + \text{Channel I}}$$

where: NVI stands for the Normalized Vegetation Index

Vegetation/biomass index values are calculated for each day of the week and cloud-free pixels are averaged to produce a weekly mean vegetation index. Weekly values are further averaged for one degree latitude and two degree longitude areas. The NVI is a measure of the amount of vegetation or biomass on the ground. The index ranges from 0 (no vegetation) to +1 (intense vegetation); however, for areas assessed in this report, the highest NVI value was +.365. These indexes can show the progress of vegetation/biomass conditions through the growing season. Conditions at any one time within the season can be compared to those at the same time in previous years. The index can be placed on a map or graphed as a time-series.

ASSESSMENT PROCESS

NOAA/NESDIS AISC uses all available satellite products and weather station reports to assess climatic impacts on agriculture (crops and rangelands). AISC focuses on the weather factors which affect crop yield, not non-weather factors that may also be important such as effects of fertilizer or losses due to pests and disease. AISC does not measure planted or harvested crop area.

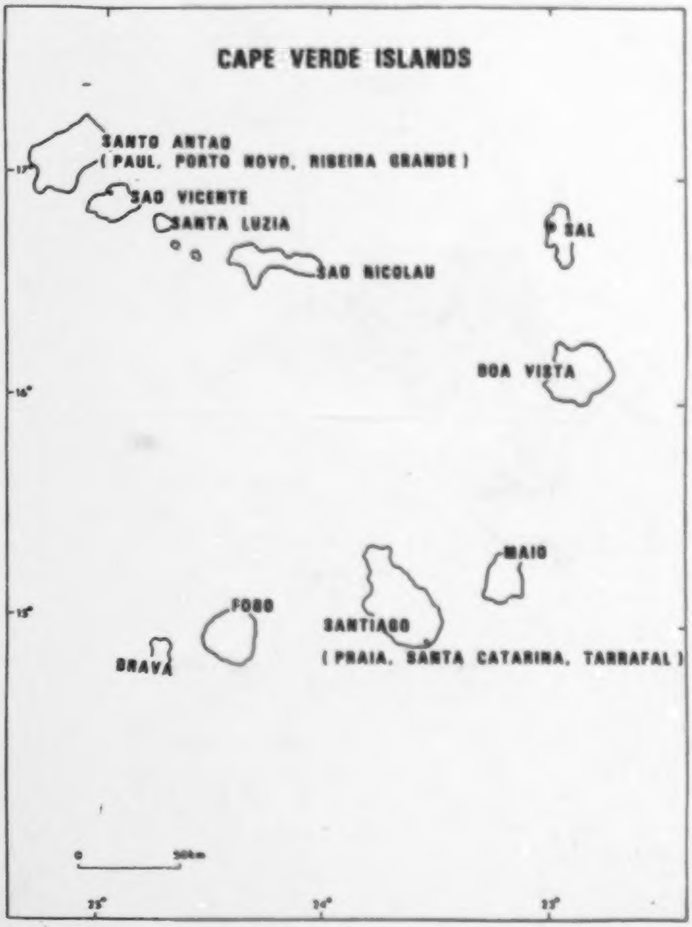
The AISC Assessment Process involves: 1) estimation of daily rainfall, 2) analysis of rainfall patterns, and 3) assessment of weather impacts on crops and rangelands. Rainfall assessments are based on daily weather reports, METEOSAT photographs, NOAA-9 photographs and AISC/ACCS color-coded satellite images. Ten day and monthly rainfall amounts are determined for weather reporting stations and crop regions. Ten day, monthly and seasonal rainfall are analyzed for the current crop season and with respect to conditions during the previous 30 years. AISC uses various agroclimatic and satellite models to assess the impact of rainfall on crops and rangelands. These include ten day, monthly and seasonal agroclimatic/crop condition models used in combination with each other; the NOAA satellite images; and vegetation/biomass index products.

The assessments in this report are subdivided into four components: 1) Overview, 2) Rangeland Vegetation/Biomass Conditions, 3) Agricultural Crop Conditions and 4) Rainfall Analysis.

COUNTRY ANALYSES

NOTE: The following is a compilation of the country analyses delivered to USAID missions in Africa. The only parts omitted are the NOAA AVHRR satellite photographic images for the individual countries, which are referred to as "fig. 2" or, in the case of the African Horn, "fig. 2" (1984) and "fig. 3" (1985). However, the Regional Analysis section near the beginning of this report contains broad scale images for the entire region (figs. 5 and 6). These are, in most cases, as detailed as the country images trasmitted to the AID missions.

CAPE VERDE ISLANDS ASSESSMENT


CAPE VERDE ISLANDS
SANTO ANTAO
(PAUL, PORTO NOVO, RIBEIRA GRANDE)
SAO VICENTE
SANTA LUZIA
SAO NICOLAU
SAL
BOA VISTA
MAIO
FOGO
SANTIAGO
(PRAIA, SANTA CATARINA, TARRAFAL)
BRAVA
17°
16°
15°
0
50km
25°
24°
23°

The first significant rains fell on July 20, 1985, followed by additional rains several days later. As precipitation was not widespread, corn and bean crops need additional moisture for favorable development.

Last year maize was damaged by a combination of dry weather in July and August and torrential rains in mid-September.

Though rainfall conditions have not been especially favorable so far this season, periodic, moderate rainfall from now into October would produce a much better harvest in November than during the preceding two years. During recent years, the growing season has been characterized by the absence of regular rainfall.

SENEGAL ASSESSMENT

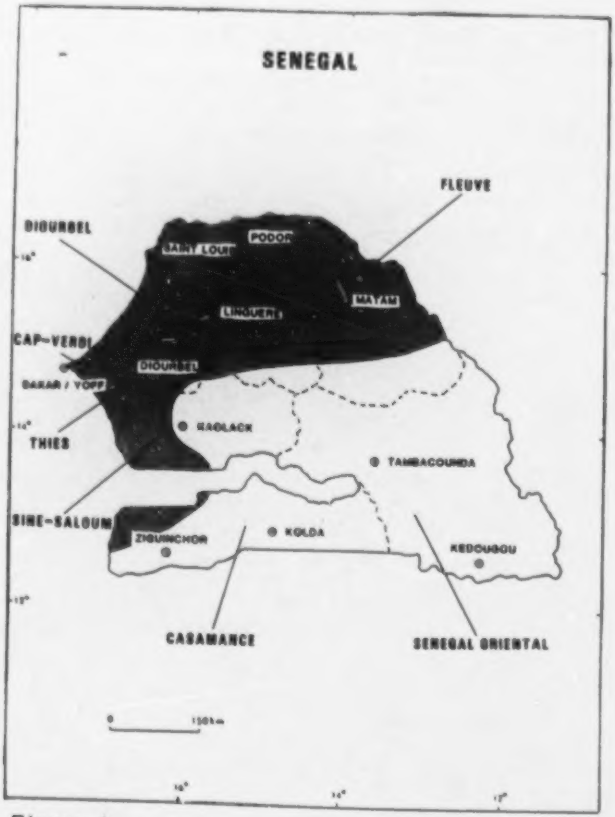

SENEGAL
FLEUVE
DIOURBEL
SAINT LOUIS
PODOR
MATAM
LINGUERE
CAP-VERDE
DIOURBEL
DAKAR / YOFF
KAOLACK
THIES
TAMBACOUNDA
SINE-SALOUM
ZIGUINCHOR
KOLDA
KEDOUGOU
CASAMANCE
SENEGAL ORIENTAL
0
150km

Figure I

Overview

Beneficial July rainfall improved crop and rangeland conditions and created favorable planting conditions in the north. It is still early in the growing season, but the overall crop situation for 1985 looks good throughout the country. However, the delay in the 1985 seasonal rains until late June has led to slow development of vegetation/biomass patterns, particularly in northern administrative regions (fig. 1). Adequate, timely rainfall during August and September will be essential for the success of the 1985 crop season.

Rangeland and Vegetation/Biomass Conditions

Satellite derived vegetation/biomass indexes (fig. 3) through mid-July suggest that conditions for 1985 are generally not as good as those for the same period in 1984. In particular, satellite images (fig. 2) and indexes for northern Senegal (i.e., Diourbel, Thies and Fleuve administrative regions) suggest low biomass patterns. However, biomass conditions should improve due to beneficial rains during July.

Crop Conditions

Crop conditions as of early August look favorable throughout the country. In the southern regions, crops planted from mid to late June received adequate rainfall during July to meet water needs. Beneficial rains during early July permitted planting throughout most of northern Senegal. However, timely and adequate rains during August and September will be essential for the success of the 1985 crop.

Weather Analysis

Rainfall conditions after June have been generally good throughout most of Senegal except within portions of the central and southeast, which are dry. July 1985 rainfall (Table 1) was near normal throughout most of the country except for Diourbel (around 70 mm, 54% normal), Tambacounda (about 110 mm, 55% normal) and Kolda (170 mm, 61% normal). May-July cumulative rainfall (Table 2) at these three locations is 40-60 percent of normal. So far, moisture conditions for 1985 are better than those in 1984 and 1983 within Thies, Sine-Saloum, Diourbel and Fleuve Administrative regions. The 1985 rainfall totals for Casamance and Oriental regions are comparable to those for 1984.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA

THIRD WEEK OF JULY

SENEGAL

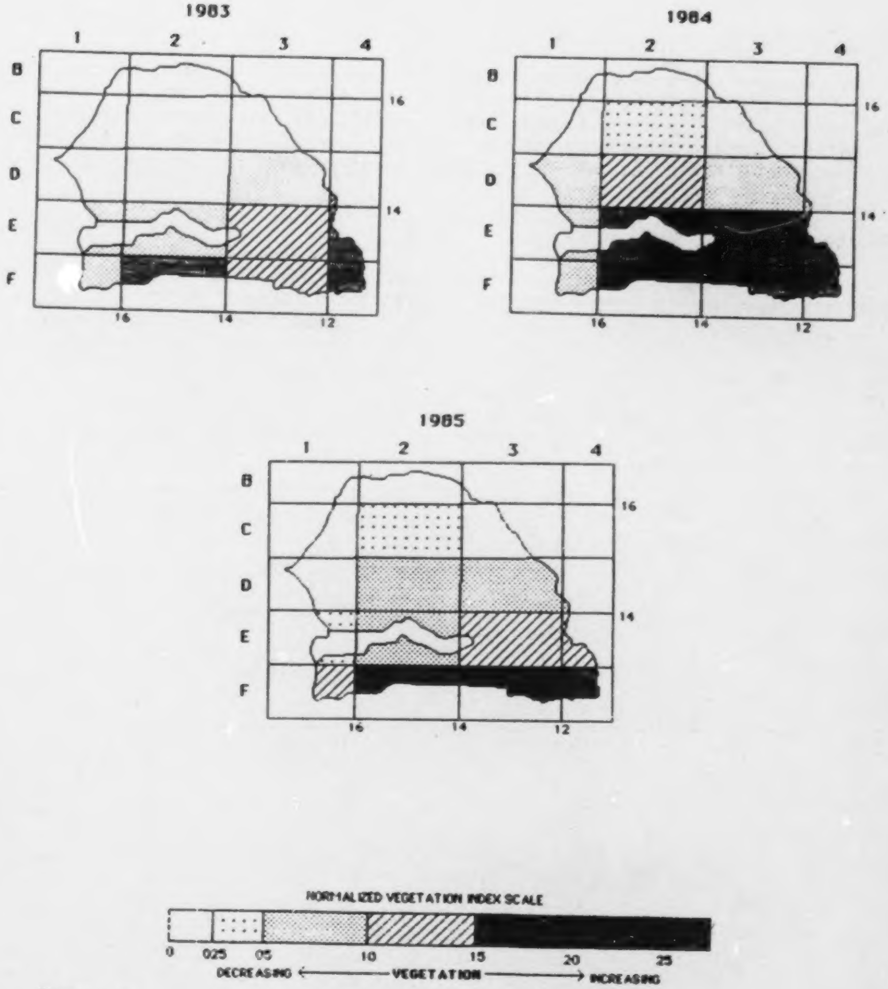

1983
1984
1985
1
2
3
4
B
C
D
E
F
16
14
12
NORMALIZED VEGETATION INDEX SCALE
0
025
05
10
15
20
25
DECREASING ← VEGETATION → INCREASING

Figure 3

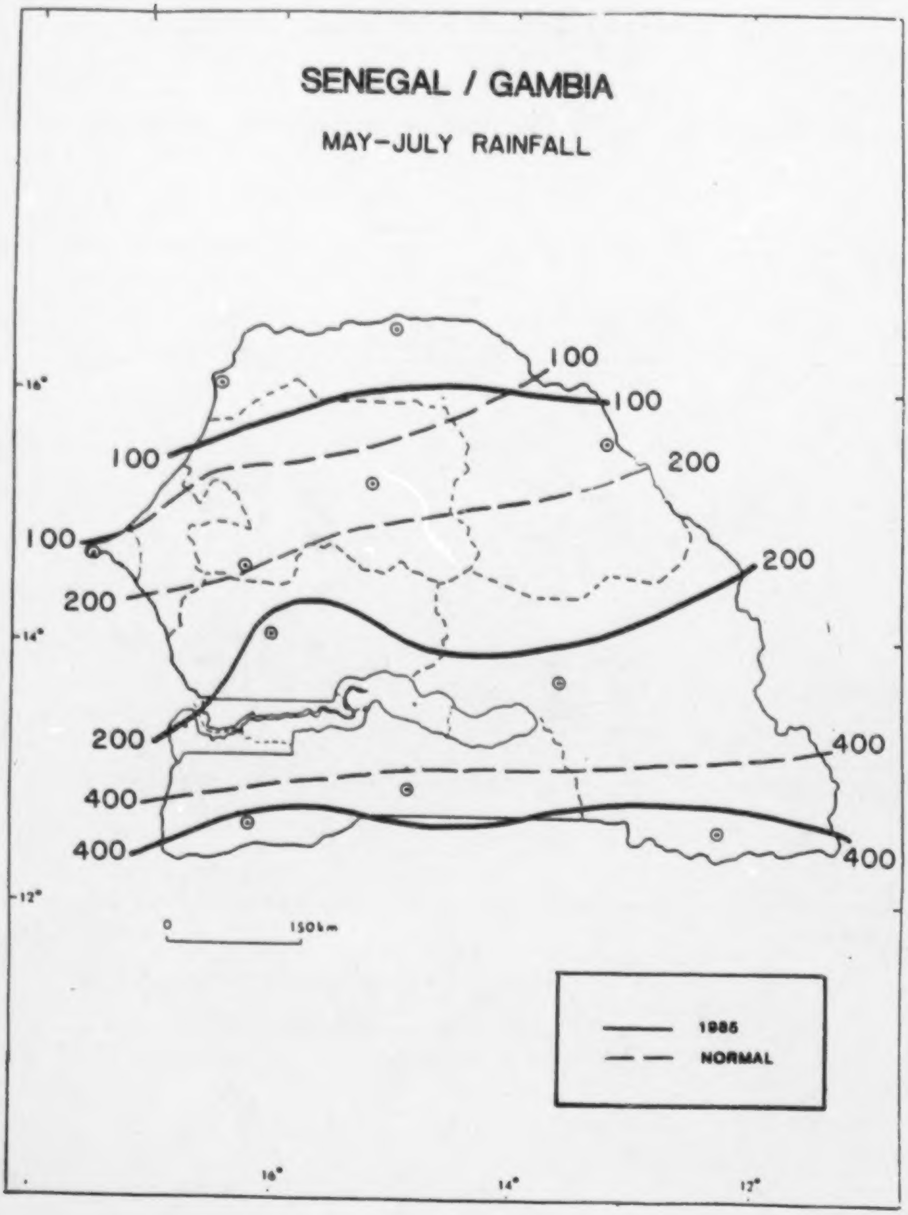

SENEGAL / GAMBIA
MAY-JULY RAINFALL
100
100
100
100
200
200
200
200
400
400
400
400
16°
14°
12°
0
150km
1985
NORMAL
16°
14°
12°

Figure 4

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Senegal Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Saint Louis	0	???	3	4	57	58	31	70	50
Podor	0	0	3	0	0	3	44	85	53
Linguere	0	0	3	18	67	50	89	91	56
Matam	0	0	3	20	69	39	119	110	58
Dakar/Yoff	0	0	3	14	140	78	67	85	58
Diourbel	0	0	3	20	56	33	107	85	47
Kaolack	1	20	75	31	63	42	246	173	89
Tambacounda	0	0	3	21	21	3	143	71	17
Ziguinchor	0	0	3	51	46	22	381	119	64
Kolda	0	0	3	104	86	47	165	60	22
Kedougou	4	9	6	188	104	56	254	93	39

Notes:

" " = No data for calculations.
"???" = Percent of normal not calculated because average rainfall is zero.
"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table I

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: **Senegal** Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Saint Louis	0	???	3	4	57	56	35	69	47
Podor	0	0	3	0	0	3	44	65	42
Linguere	0	0	3	18	62	44	107	84	42
Matam	0	0	3	20	65	39	139	100	47
Dakar/Yoff	0	0	3	14	127	75	81	90	61
Diourbel	0	0	3	20	50	33	127	77	33
Kaolack	1	20	75	32	59	36	278	142	83
Tambacounda	0	0	3	21	17	3	164	51	6
Ziguinchor	0	0	3	51	43	17	432	99	47
Kolda	0	0	3	104	77	39	269	65	17
Kedougou	4	9	6	192	85	33	446	90	31

Notes:

"   " = No data for calculations.
"???" = Percent of normal not calculated because average rainfall is zero.
"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 2

UNCLASSIFIED

Department of State

INCOMING TELEGRAM

PAGE 01 ADDIS 05332 091350Z
ACTION AID-00 5955 021727 AID3954

ACTION OFFICE TFAF-02
INFO AAAF-02 AFEA-03 AFDP-08 AFDR-06 FVA-01 OFDA-02 AAXA-01
FFP-09 AFDA-01 FVPP-01 ES-01 AGRI-01 COM-02 OMB-02
TRSY-05 RELO-01 /046 A1 11-9

INFO LOG-00 INR-10 EUR-00 OIC-02 AF-00 CIAE-00 EB-08
DODE-00 IO-16 NSCE-00 FORE-00 AGRE-01 RP-10 /047 W
------------------127022 091353Z /38

R 091301Z SEP 85
FM AMEMBASSY ADDIS ABABA
TO SECSTATE WASHDC 2319
INFO AMEMBASSY KHARTOUM
AMEMBASSY NAIROBI
AMEMBASSY ROME
USMISSION GENEVA
USMISSION USUN NEW YORK

UNCLAS ADDIS ABABA 05332

AIDAC, AFDROUGHT

STATE FOR AF AND AF/E; FOR TFAF; NAIROBI FOR REDSO/ESA; ROME FOR FODAG

E.O. 12356: N/A

SUBJECT: COMMEND NOAA ASSISTANCE ON AID/ADDIS FOOD NEED ASSESSMENT

REF: NOAA-ADDIS CABLE OF 30 AUGUST 1985

1. AID/ADDIS WANTS TO COMMEND NOAA/AISC FOR THE FINE REPORTING THEY HAVE BEEN DOING ON FARM WEATHER CONDITIONS IN ETHIOPIA VIA THE SPECIAL CLIMATE IMPACT ASSESSMENTS, AND FOR THEIR TIMELY ESTIMATES OF CLIMATE EFFECTS ON YIELD, PROVIDED IN REFTEL.

2. NOAA WORK HAS BEEN VERY USEFUL IN ASSISTING AID/ADDIS FOOD NEED ASSESSMENT FOR 1986.

3. NOAA/AISC IS TO BE COMMENDED FOR A JOB WELL DONE. WE LOOK FORWARD TO FUTURE REPORTS, ALL OF WHICH ARE RECEIVED AND USED BY GOVERNMENT AGENCIES. OFDA IS TO BE COMMENDED FOR ARRANGING FOR NOAA DO UNDERTAKE THESE CLIMATE IMPACT ASSESSMENTS.

4. PLEASE PASS TO NOAA/AISC. ONEILL

Item # 4
for Record

UNCLASSIFIED

Mr. Scheuer. Our last witness is Dr. Jagadish Shukla of the Department of Meteorology at the University of Maryland. Please proceed, Dr. Shukla.

Dr. Shukla. Mr. Chairman and members of the subcommittee, I was asked to appear to testify on the influence of land use changes on the climate and the need for an estimated cost of a research plan. But before I address these questions specifically, I thought I would make some general remarks about our current understanding of the question of climate predictability and climate variability, of which the African drought is but one tragic example.

I think, Mr. Chairman, you gave a very passionate description of what kind of tragedy we are facing in Africa. But I think that there are a few other tragedies that I would like to mention. This is one of the greatest abnormalities of climate in an area, which is occurring in the area where there is the least amount of data. This is the biggest anomaly of climate that we might have observed about the meteorological services of these countries are least developed, and we have the least amount of reliable systematic long-term information to diagnose this information. Of course, it has been going on for such a long time.

I think that the other small tragedy I will mention is that, during the last 10 or 15 years, as the previous speakers have pointed out, there has been good progress in understanding the basic mechanisms of climate change, how ocean and atmosphere interact and produce a large climate anomaly, how land and atmosphere interact and produce a large climate anomaly. But we haven't had a systematic focused research plan on the African drought, although it has been going on for a long time.

I think that the two questions I was asked to address, one was influence of the land use changes and variations in vegetative cover, and climate trends and variability in sub-Saharan Africa. I must admit that our knowledge about this question is so little that only after 15 minutes of listening to other speakers I am afraid I have to start repeating some of the things that they have said already.

There are two approaches to answer this question. One is a very systematic analysis of data and, another, very systematic modeling effort. The analysis of data can give you an idea about what the problem is. But in order to isolate a particular physical process, we need some good climate models to apply them. None of the two have been done to answer the particular questions that I was asked. So, therefore, my answer is going to be based on what indirect evidence we have, based on insufficient data and crude models.

I think that there is enough evidence based on whatever modeling results that we have that the local changes in the land surface properties can produce changes in the climate which are consistent with the kind of trend that we are seeing. There is no evidence that the local changes are the cause of producing such a change, but there is a good reason to believe that they might be amplifying an already existing effect due to the global factors.

I think that I will not say much more about the first question, I just said, because, as some of the previous speakers have spoken, there is very little that we can say definitely.

I think I would like to come to the second question, about the need for a sustained research effort. I would like to propose that a sustained research effort be established to study the variability and predictability of droughts in general, with particular emphasis on the African drought. I was asked to give an estimate of the cost of such a research effort. After talking with several colleagues and several people who have been in the field, I propose that an approximate cost of such an effort would be about $10 million per year.

Now, I think I should tell a few words about why we need such a plan and what do we expect to accomplish from such a plan. First of all, there is no specific research plan already for the African drought problem. As we have heard, the National Climate Program Office is in the process of developing such a plan, and we hope that such a plan will be coming out in the near future.

But we also need to understand the basic mechanisms of drought in general. What is happening over Africa today can happen over another part of the globe. In fact, the example of the Dust Bowl of the 1930's falls in the general category. We still do not understand the basic mechanism. And we cannot rule out the recurrence of such phenomena either over the United States or over other parts of the globe. So, we do need a very sustained research effort to understand the problem.

The third point I would like to make in support of this plan is that I think that the research work during the last 10 to 12 years, such as has been mentioned, has brought us to a stage where we are now ready to start a systematic research plan where we can understand the mechanisms which determine the climate change at these time scales. And if we cannot predict exactly what is going to happen, we can at least understand the nature of predictability of these systems.

I think that one of the important questions that we would like to know is, were local manmade factors a cause in perpetuation of this drought? I think that in the absence of that information we cannot make good policy decisions, either about agriculture or about land use. And I think that the only way to be able to give a reliable answer which can be rigorously justified is by analysis of data and by modeling efforts that have been developed during the last 10 to 15 years.

In addition to this research plan, the other proposal I have made is about trying to help develop the meteorological services of the African countries. Here I am proposing that the United States take a leadership role in organizing and developing an international plan for improvements in the weather services of the African nations and contribute toward its implementation by the World Meteorological Organization.

There is some data already in Africa which never comes here. First of all, there is very little data because there are only a few stations. The one that is taken doesn't come because of communications. So, we need to train local people so that they will maintain an infrastructure of meteorological weather service in those countries where the data will be regularly taken.

We also need to upgrade the communications facilities so that the data will be transmitted and will be available.

I think that, in summary, I would like to say that the climate research by its nature needs sustained long-term effort. I think that the results that have already come out during the last 10 years can provide some potential payoffs in predictability of such major systems as African drought. I think we should do it.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Shukla follows:]

STATEMENT BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

ON

DROUGHT IN SUB-SAHARAN AFRICA

by

J. Shukla
University of Maryland
College Park, MD 20742

September 19, 1985

Mr. Chairman, and Members of the Subcommittee:

I was asked to appear before the Subcommittee to testify on:

1) The influence of land use changes and variations in vegetative cover on climate trends and variability in sub-Saharan Africa, and
2) The need for, and estimated costs of, a sustained research plan addressing long-term man-made and natural causes of climatic variability in Africa.

Before I address these questions specifically, I will make some general remarks about our current understanding and prospects for prediction of global climatic fluctuations, of which the African drought is but one outstanding and tragic example.

Let me first give a very brief summary of our current understanding of the mechanisms that produce weather and climate fluctuations on the planet earth. For the convenience of further discussion let us distinguish between the words weather and climate. By weather we shall mean the day to day changes of the instantaneous states of the atmosphere as defined by observations of temperature, wind, pressure, humidity and rainfall. By climate we shall mean space and time averages of weather for periods ranging from 2 weeks to 10 years and spatial scales ranging from one million square miles (1000 miles x 1000 miles) to the size of a continent.

During the last 40 years, great progress has been made in understanding the physical processes and mechanisms that cause day to day weather changes. This has come about due to two main factors: 1) a large increase in the number of observations which makes it possible to observe and describe the atmosphere, 2) major scientific advances in our understanding of the physical and dynamical processes in the atmosphere. Society is receiving tremendous practical benefit due to these advances because the weather forecasts for a few days given operationally by the weather services today are far superior, qualitatively as well as quantitatively, to what they were 40 years ago. In fact the major advancements in predicting day to day weather have come only recently during the past 20 years. This has been made possible at least in part by the tremendous technological advances in space observations, communications and high speed computers. However the most crucial development in this field during the past 20 years has been our ability to develop mathematical models which describe the physical laws that govern the behavior of the atmosphere.

Weather forecasting, therefore, is not empirical anymore, but is based on the scientific foundations of the laws of physics. The weather forecasts are now prepared by integrating a set of mathematical equations describing these laws. Since these equations are very complex and the number of equations are very large (about 1 million to cover the global domain), and they must be solved in small time steps of a few minutes, very high speed computers are required to prepare weather forecasts for a few days. Such a system of data collection, data analysis and complex computer models is already in place and weather forecasts for a few days are being made operationally. We now understand that the weather changes for the next few days at any place are almost completely determined by the weather today everywhere on the globe, and therefore, if we know the weather today very accurately and if we have a very good physical model we can make good predictions for weather for tomorrow or for a few more days. This is the reason why major emphasis has been on observing the weather 'today' as accurately as possible over the whole of the globe.

Due to our inability to observe the global weather perfectly and our inability to write the exact mathematical equations, there is going to be an upper limit for which weather can be predicted. Our present estimates suggest that this limit is a few weeks. We refer to this as the upper limit of atmospheric predictability. This will imply that it will not be possible to predict the instantaneous state of the atmosphere at each point on the globe beyond a few weeks. However, if we relax our requirements from predicting instantaneous states to time averages and from predicting at a point to spatial averages, there is reason for optimism. The most important advancement in this regard has come during the last 10 years by recognizing that the space- and time-averaged state of the atmosphere beyond a few days (say, 2 weeks) is not only determined by the initial state of the atmosphere but also by the state of the underlying earth's surface.

We now have a better understanding of the mechanisms that produce fluctuations in regional climate. The most important factors that influence regional climate fluctuations are found to be interactions between the oceans and the atmosphere, and between the atmosphere and the land-surface processes. Sometimes, certain parts of the ocean surface can warm up by 2-4°F and that can produce quite significant changes in the atmospheric circulation and rainfall over large parts of the globe. Similarly, changes in the amount of moisture available for evaporation from land surfaces can influence the amount of water vapor going into the atmosphere which in turn can influence the atmospheric circulation and rainfall. This implies that, either for scientific research to understand these fluctuations or for the practical task of predicting them, we not only need the global observations of weather (as we did for weather forecasting) but we also need global observations of boundary conditions at the earth's surface. Furthermore, the physical models that are required to understand and predict these long term changes have to be much more realistic (and complex) so that they can quantitatively calculate the interactions at the interfaces between atmosphere and ocean and between atmosphere and land.

A pertinent question in this context is: Are we ready to embark on a massive project of using a complex physical model of the atmosphere-ocean-land system and global boundary conditions to predict the global climate for next month or season? I feel that the social and economic benefits of evan a marginally accurate long range forecast are so large that we should give a high priority to establishing such a system.

Now I will respond to the first issue I was asked to testify on: the influence of land use changes and variations in vegetative cover on climate trends and variability in sub-Saharan Africa.

It is not possible to adequately address this question at this time because we did not have either the necessary data or adequate models to carry out a meaningful study of this issue. A systematic study of the effects of changes in land surface properties, either natural or man-made, has not been carried out using realistic coupled models of the atmosphere and land surface. In fact, we did not even have such models until very recently. Also, very little of the necessary data is available for diagnostic studies. Unfortunately, even most of the routine conventional upper air meteorological observations are not available. Either there are no observing stations, or the existing stations do not take observations routinely, or the observations are taken but not transmitted to the international meteorological community.

If there were long records of land use practices, vegetative cover, land-surface properties, and the three dimensional structure of the atmosphere, it would be possible to carry out some empirical studies to find interrelationships among these factors. However, data analysis alone will not be able to produce reliable conclusions about causality. The only way to address the question of whether a particular change in a land surface property will produce changes in climate is by constructing and applying realistic models of the climate system. It is only then that one can carry out controlled experiments with the model and simulate the possible effects of particular changes in land surface properties. Some preliminary studies that have been carried out using crude climate models support the hypothesis that changes in the land surface characteristics can change the local rainfall. In particular, an increase in albedo (reflection of solar radiation) or decrease in moisture availability of the soil will tend to decrease rainfall, especially over the climatically sensitive areas of the subtropics. Therefore, these preliminary studies support the conjecture that changes in the land surface properties in the sub-Sahara regions could be one of the contributing factors in reducing rainfall in that region. There is no evidence, however, that the present African drought was caused solely by changes in land surface characteristics. In fact there is some indirect evidence that the initiation of the present drought could be due to global scale fluctuations of the atmosphere-ocean-land system. Based on the results of currently available observational and modeling studies, it is reasonable to conjecture that the unprecedented intensity of the current drought may be a consequence of the fact that the rainfall reduction due to global scale fluctuations has been further amplified by local effects due to changes in land surface characteristics. It should be possible to test the validity of such a conjecture using currently available models of the climate system. It just has not been done.

Let me respond to the second issue I was asked to testify on: the need for, and estimated costs of, a sustained research plan addressing long-term man-made and natural causes of climatic variability in Africa.

I would like to propose that a sustained research effort be established to study the variability and predictability of droughts in general with particular emphasis on the African drought. The approximate cost for such an effort will be about 10 million dollars per year.

Such a research plan should include among its objectives: a comprehensive program for diagnostic analysis of available surface, upper air and satellite data for Africa and the adjoining oceans and land masses, and a major effort in modeling the land surface processes for development of realistic global climate models. The diagnostic and modeling studies should be carried out in tandem with the ultimate objective of producing forecasts suitable for providing guidance for making policy decisions on agriculture and land use practices.

I would like to submit the following items in support of this proposal.

1) At present there is no specific and focused effort on the analysis, modeling and prediction of African droughts.
2) It will help us understand the basic mechanisms of droughts in general. It is quite resonable to assume that other parts of the globe also can be affected by prolonged droughts. In fact, the "dust bowl" of the 1930's in the Great Plains is an example that falls in the same general category as the current African drought. The possibility of a recurrence of similar droughts cannot be ruled out. It is extremely important that we begin to develop our capabilities so that in future at least we can recognize that a prolonged drought has begun.
3) We are now ready, scientifically and technologically, to launch such an effort. We have gained a better understanding of the way the oceans and the land surfaces influence the climate and we think there is high potential for prediction of average conditions of atmospheric circulation and rainfall. Even if we cannot make accurate long range predictions, we can, at least, determine the degree of predictability of unusual episodes such as recurring droughts.

For a better understanding and possible prediction of a complex phenomenon like the African droughts, it is essential to have a sustained research effort.

Research in climate prediction requires a long term commitment. It is likely that even the most sophisticated models of the climate system cannot provide very precise answers to all the questions a policy maker may ask. However, realistic physical models can provide objective guidance for making meaningful assumptions on which a policy is based. For example, if modeling results strongly suggested that the local land surface properties were the sole determinants of the local rainfall deficiency, serious planning would be required to change the land use practices. On the other hand if the local factors had negligible effect on drought, there would be little reason to plan for a major change in the land use practices.

We are hopeful that the international program on Tropical Oceans and Global Atmosphere (TOGA), in which the United States participates, will help in the understanding and prediction of the large scale changes that occur due to the interactions between the atmosphere and the oceans. Similar efforts are needed for the understanding and prediction of the large scale changes due to interactions between the atmosphere and the land surfaces. The International Land-Surface Climatology Project (ISLSCP) is a good start in this direction because its aim is to use satellite technology to derive land surface properties.

In addition to the research plan that I have just outlined, and that can be carried out by U.S. scientists, I would also like to propose that the U.S. take a leadership role in organizing and developing an international plan for improvements in the weather services of the African nations, and contribute towards its implementation by the World Meteorological Organization. This plan would include, among its objectives, expansion of the present network of meteorological observation stations, arrangement for routine collection and exchange of all the data from the total network, and technical training for the staff of the African weather services. In addition to setting up the observational platforms, and training the personnel to operate them, additional resources will be required for routine operations of the observational network.

Scientific and technical personnel of these nations themselves will carry out operational management of the network, dissemination of data to other nations, and analysis of data for research. These efforts can be coordinated and implemented through the offices of the World Meteorological Organization. The approximate costs of upgrading the weather services of about 25 sub-Saharan countires by setting up new observational stations, establishing regional and international links for data exchange and training would be about 15 million dollars which can be shared among several donor countries and various international agencies.

Mr. **SCHEUER**. Thank you very much, Dr. Shukla. Thanks to all of the panel.

I now recognize my colleague, the ranking member of this subcommittee, Claudine Schneider of Rhode Island.

Miss **SCHNEIDER**. I would like to ask my questions in a two-part way. First of all, each of the witnesses has indicated the need to assess the degree of the impact of climate on the overall situation of starvation. Granted, there are a variety of different, I guess we can say, theories. I would just like to run a few of these by you to get some feedback.

I think that there is pretty much of a consensus that overcultivation, overgrazing, deforestation, all of these things are stripping the land of its basic vegetation. There is the thought that the bare rock and soil has a reflective capacity so that what is reflected keeps the atmosphere warmer. That then disperses the clouds and then reduces the amount of rain that would ultimately fall anyway.

Now, how widely accepted is that theory about the cyclical impact?

Dr. **SHUKLA**. Can I respond to that?

Miss **SCHNEIDER**. Sure.

Dr. **SHUKLA**. First of all, I am impressed by your question. I was told to keep my comments nontechnical. Your question is much more technical than my whole talk.

That is a theory that was proposed about 10 years ago. There have been several numerical model experiments done with some very crude models, but they all tend to support that hypothesis: if that happens, it will tend to decrease the rainfall.

There is no model result that contradicts that hypothesis; let me put it that way.

Miss **SCHNEIDER**. OK. And Dr. Rasmusson, you were giving me some body language that perhaps that's your feeling, too?

Dr. **RASMUSSON**. Not being a modeler, I don't really have a position on it except that it has to be resolved.

I might just mention that that is not the only possibility of a feedback. There is also the moisture availability at the surface. And more recently, there have been some results which indicate that the possibility of the changes in roughness of the surface due to the vegetation changing might also have an effect.

These are things that will require somewhat more sophistication in the models. They are getting there fast. It is an important issue.

Miss SCHNEIDER. Dr. Nicholson, you wanted to comment?

Dr. NICHOLSON. Yes. I think that has to be approached from two points of view. You talked mostly about the question of stripping the land, desertification, et cetera. But there is another aspect of that. Once a dry year occurs, the land has also been changed by the drought itself.

Miss SCHNEIDER. Right.

Dr. NICHOLSON. And this is a very important component that has not yet been evaluated. I suspect that that has been the more important component in the past. But I think one needs a systematic study to determine what extent of the land surface changes have in fact been due to human activity and what was caused by the drought itself.

Miss SCHNEIDER. Another theory that seems to be gaining some support—and I am wondering if I could have some feedback on this—is the whole impact of the amounts of carbon dioxide in the atmosphere, as we all refer to as acid rain, by burning our oil and coal. There is a belief that even though we may be burning it in the western hemisphere in some of the more developed nations, it is also having an impact globally on raising the climatic temperatures in particular over Africa. I wonder if I could have some feedback on that particular hypothesis? Yes, Dr. Nicholson?

Dr. NICHOLSON. I think there is an overwhelming consensus that we are facing a major problem climatically due to carbon dioxide. But I don't think there is any evidence at all that this particular drought can be attributed to carbon dioxide. I think it is a big unknown. I think the idea is that it will change but how we don't know. And I don't think we have seen any effects yet.

Miss SCHNEIDER. What I am primarily referring to is the general acceptance that this would be increasing average temperatures and also the variability of the climate. But I think that we all recognize here, both all of you and we at this end of the table, that there are many different causes of the drought situation. But I am curious to know to what degree that you believe that the acid rain element is one of those variables that ought to be studied, ought to be considered in the overall climatic changes that are affecting Africa.

Dr. NICHOLSON. I personally don't believe that it is a major factor yet.

Miss SCHNEIDER. Yet.

Dr. NICHOLSON. Yet.

Miss SCHNEIDER. OK.

Dr. NICHOLSON. I think that, if there is a major change that occurs, it will affect Africa. I don't think there has been major effect in Africa yet. And I would put that low on my list of priorities for climate study with respect to Africa.

Miss SCHNEIDER. OK. Dr. Shukla.

Dr. **Shukla**. Yes; I think I will just repeat that. There is no evidence at all that the CO^2, the so-called greenhouse effect, has any role to play in the African drought problem. I will go on a step further. I think there is a lot of evidence that it is the interaction between the atmosphere and the land or the atmosphere and the ocean that are very important to determine these drought factors.

Miss **Schneider**. Well, I sort of feel like we have moved to a few specifics upon which we can build a case. Going beyond that, we need obviously Federal dollars to support continuation of research in these areas. I think that probably those of you who are at the witness table today are aware of the decline in research dollars available for climatic studies. I just asked my staff assistants here to dig out some numbers for me just so that I could verify this, but I know that in the Department of Energy alone, two-thirds of the budget is being used for defense purposes under the Department of Energy research budget.

In our overall, all U.S. spending for research and development, more than half of that money is once again being spent for defense. I personally happen to find a strong correlation between dollars expended in this peaceful use of averting conflict and wars perhaps over resources. Recognizing that we have limited research dollars, I am curious to know that—Dr. Rasmusson, you were saying that one of the things we most needed to do was to increase not only the research funding but make sure that it is wisely focused and that we have priorities established. Now, could you give me a few of the ideas you have insofar as priorities are concerned? And ought there to be some dollar shifts to reflect where our priorities need to be?

Dr. **Rasmusson**. When I referred to priorities, I was thinking in the general area of what is going on now in terms of research related to African drought specifically. Of course, what I laid out in my summary and testimony were the kinds of priorities that I thought ought to be emphasized, namely the links with the ocean, the research on the land surface, the development of the modeling capability to do that.

With regard to the shifting of priorities and in terms of research dollars and all, I am not really in a very good position to make a judgment on that without knowing the whole framework——

Miss **Schneider**. Picture.

Dr. **Rasmusson** [continuing]. The whole picture, yes.

Miss **Schneider**. Well, we're in that position. A few of us on this committee don't happen to share with enthusiasm where some of those research dollars are going, but we are attempting to alter those priorities at any rate.

Were there any other comments about priorities that do need to be set or how we can better focus not only our own national effort in research but also the international effort? Yes, Dr. Hock.

Dr. **Hock**. I think one of the issues that came out of the preparatory meeting for the Berlin economic summit relating to remote sensing was that for monitoring you need a receiving capability. In many of these countries in Africa there is no HRPT receiving capability. If we are talking about beautiful products like this, we basically need a capability such that these meteorologists and geographers and agricultural economists can have their own image. Now, there are some breakthroughs in terms of technology recently that bring the cost of such receiving stations down. There are also some breakthroughs in terms of using imagery on IBM PC's, which would mean the availability of training and using floppy disks as a training and as an assessment aid in some of these countries.

But if we are talking monitoring, I think we have got to consider receiving capabilities.

Miss SCHNEIDER. All right. I appreciate your bringing that up.

Yes, Dr. Shukla.

Dr. SHUKLA. I would just like to make a general comment about the question on priorities. I would like to address the question of weather prediction and weather predictability.

There has been the general belief that the weather is not predictable beyond a few days. That has been sort of a part of our thinking for years and years. I think that what has happened during the last 10 to 12 years is a major revolution in meteorology. For the first time we now understand that, although we cannot predict exact weather over Washington, say, after 20 days, there is a reasonable chance of predicting whether the whole winter is going to be cold or warm, or the whole summer season. The reason is because we have discovered new relationships between the atmosphere and the ocean interactions: What happens over the Pacific Ocean determines the global climate. You might have heard about El Nino and Southern Oscillation.

We have understood the mechanisms of interaction between the land and the atmosphere. So, I think that we have entered a new period in the question of predictability of climate. I think that it will be all Earth that we need consider our priorities, and the potential payoffs of long-range predictions, with marginal accuracy, are really great.

Thank you.

Miss SCHNEIDER. Thank you.

Dr. Nicholson.

Dr. NICHOLSON. I think one priority should also be salvaging the data that we do have, and this is a very difficult situation. It is not only salvaging, putting it in an archive, but also disseminating. It is a great effort to try getting data from Africa. And I think this is one area that we could help. If you see people handwriting records everywhere in huge notebooks and you take a look at the capability we now have to plug it into a computer just like that, I think this is one technology transfer that would help tremendously.

Miss SCHNEIDER. And how best do you foresee us going about doing this? Would it be through—well, I will let you come up with the idea.

Dr. NICHOLSON. Well, I think there are some regional centers that are—one is being operated right now, the AGRHYMET center in Niamey. And there are plans for a similar center in eastern and southern Africa. I believe this is what you were referring to in part. But it goes a little bit beyond just the agricultural research. One priority is in fact the archiving. NOAA has a computer technician that handles some of these problems in west Africa, but that's only one particular region. Others are in grave danger of losing 50 years of data by lighting a match in the wrong spot. And I think these centers could be one way.

Miss SCHNEIDER. OK.

Dr. HOCK. I would really concur on that. I again talked with Fenwick about this in FAO. Her big concern is long-range, long-term climate data. She pointed out that there was a need even to go back to some of the European capitals, for instance Paris, and get these longer-term climate records.

Miss SCHNEIDER. Yes?

Dr. RASMUSSON. I will make one last point. In mentioning, rephrasing the priorities that I had mentioned, I should again restate the question of data and the problem of data over Africa and perhaps make the point that this is not only important for the question of African drought, and the question of the climate studies, but it is of basic importance for our day-to-day weather forecasting as well. When you get out to more than 3 or 4 or 5 days, you are dealing with the entire atmosphere. And the hole in the network in Africa now is a significant problem in terms of the medium range forecasting.

Miss SCHNEIDER. OK.

Let me just share with you that the members of this committee experience a lot of frustration at times when we are overseeing various monitoring programs or various research programs whereby we see EPA doing a piece of the research, NOAA doing a piece of the research, DOE, et cetera, et cetera, et cetera. Insofar as climatic studies are concerned, climate studies are concerned—excuse me, scratch that—I am curious to know about the coordination between the USDA and NOAA, NASA, and AID, and how that coordination of information can be improved. Once we get our act together here, then we take the next step of information transfer. And I think that we have some acknowledged problems within our own bureaucracies.

Suggestions for solutions?

Dr. HOCK. Well, I can just comment on what we are doing right now. And that is a joint sponsored task force on Africa, USDA-AID. And what they have done, I think very successfully, is bring in the other agencies to participate in monitoring Africa. We, NOAA, participate. It meets monthly. We share and provide an exchange of data. We are doing the meteorological assessments. We also provide some indexes which are reviewed by USDA. And then AID sends out the cables.

So that there is coordination going on right now. I think it could be improved.

Miss SCHNEIDER. There are what, about 15 different Federal agencies that are involved?

Dr. HOCK. Exactly, exactly.

Miss SCHNEIDER. You meet under the auspices of the State Department? Is that the umbrella?

Dr. HOCK. Yes, it's really under the auspices—it's over at AID, but USDA is also very actively participating.

Miss SCHNEIDER. Have you already held your September meeting?

Dr. HOCK. I think that's this week.

Miss SCHNEIDER. Pardon me?

Dr. HOCK. I think that is this week.

Miss **Schneider**. This week you'll be meeting. Could you carry a message——

Dr. **Hock**. Sure.

Miss **Schneider** [continuing]. From the Congressional Science and Technology Committee, that we are going to follow up on the work that is being done and look forward to looking at what kind of coordination plans are being devised so that we can expect efficiency in our Federal Government.

And then just the final thing that I wanted to touch on, which to me, while in Africa, seemed to be one of the saddest dilemmas that the Africans are facing, is that more than anything else, they were not necessarily asking for technology. They were asking for information. And I think that our information transfer gives us such an opportunity to provide assistance there. And I am not aware of appropriate mechanisms for providing the Africans with climate information in a timely fashion. I wonder if any one of you could elaborate upon what is being done now and how it could be improved and if there is a role that this committee can play.

Dr. **Hock**. I could just comment on the cables that are going out. They are in English and also in French. We are sending out special assessments in English and in French to all eight of the Sahelian countries and Sudan and Ethiopia.

I think there is more that could be done in terms of expanding our outreach to some of these government agencies. But I think what is needed there are seminars and technology transfer activities to show decisionmakers the methodology and to walk them through it.

I think much more can be done in technology transfer. We plan to have a series of visits this fall where we will have seminars in these countries and training and also work through the AGRHYMET facility in Niamey.

Miss **Schneider**. Well, one of the things that I had been talking to someone about was to, through the Peace Corps, improve the training of the African nationals so that, once you send them our material, they could interpret it. I mean, even if it's in the same language, I can assure you there are words which I am quite familiar that NOAA uses that perhaps half the people in this room would not even know what it meant, despite the fact that it was in English. So, I think that that has to be a sensitivity. But the idea of training through the Peace Corps, I wonder if you have any thoughts on that?

Dr. **Hock**. That idea has come up a number of times, and we haven't done much in terms of working with the Peace Corps. But I think it makes a lot of sense in terms of getting out to the field.

Miss **Schneider**. Well, I am working with a task force made up of Lorette Rupe and others who are from a broad spectrum of representation. So, we, too, are looking for solutions and encourage you not to limit your input to this one hearing, but if there is additional information at a later time you would like to share with me, I would be happy to receive it.

Dr. Nicholson.

Dr. **Nicholson**. That sounds like a good idea, but I think one has to make sure that the Peace Corps doesn't sort of override the local power structure——

Miss **Schneider**. Oh, of course.

Dr. **Nicholson** [continuing]. In disseminating the information.

Miss **Schneider**. Of course, yes.

Dr. **Rasmusson**. May I make a comment?

Miss **Schneider**. Yes.

Dr. **Rasmusson**. The World Meteorological Organization, which coordinates the Volunteer Cooperation Program, I think is a very good mechanism for the long-term solution of a lot of these problems. It may not be the best solution in the short term, but in terms of having a system that works year in and year out, decade in and decade out, it seems to me that in the long run this is probably the way to go.

There is another aspect, too. Now, there's a lot of help beginning to come in. And the WMO now is coordinating this. The problem of getting in each other's way will perhaps develop in terms of the international programs. So, I would like to put in a good word for the World Meteorological Organization and coordination through that mechanism, which again goes back to the basic structure of weather data exchange, the World Weather Watch, which is what we live on in terms of getting our data around the world.

Miss **Schneider**. Right. Thank you very much.

Yes, Dr. Nicholson.

Dr. **Nicholson**. Just one point. One thing that we are planning on doing through WMO in part is, I am putting together a rainfall atlas that is aimed at a number of disciplines including agriculture. This is being sponsored by U.S. AID. We are planning on making this available to all of the weather services.

Miss **Schneider**. Very fine. Thank you.

Thank you, Mr. Chairman, for the opportunity to ask all of my questions.

Mr. **Scheuer**. Thank you, Claudine.

Do any of you think it would be advisable to expand the world climate and environment monitoring system that is in place at the present time? Is there any further work that can be done on that? The global environment monitoring.

Dr. **Shukla**. Right. I think it is very heterogeneous. The—

Mr. **Scheuer**. Pardon?

Dr. **Shukla**. It is very uneven all over the world. And the one over Africa is the one which is probably the worst in the world.

What I proposed in my formal statement was that we expand the African network and make sure——

Mr. **Scheuer**. You would expand what?

Dr. **Shukla**. The network——

Mr. **Scheuer**. Yes.

Dr. **Shukla** [continuing]. Of observations over Africa. And then make sure that the observations are actually taken. Just because there's a station there doesn't mean—many times observations are not taken.

And then after they are taken, make sure that they are sent on the international communication lines.

Mr. **Scheuer**. I am going to ask unanimous consent that members may be permitted to submit questions in writing in the next 10 days. We will hold the record open for the answers to come in, so that any of the members here who would wish to submit questions may do so.

[See appendix.]

Mr. **Scheuer**. Dr. Shukla, you mentioned the need for additional research on African drought. Which agency would you like to see coordinate the program? And what should the various component elements of this program be?

Dr. **Shukla**. Well, I think that the agency that already has a start at something in this line is the National Climate Program Office of NOAA, which started developing such a plan. I understand within the next few months they are calling a group of scientists from the United States and other countries in the world to put together such a plan.

Now, the essential components of such a plan, in my opinion, are the first, as we have heard all along, augmentation of observations. We need the basic data. We need the basic data to define the problem and to diagnose the problem. And then to develop numerical models which can help us sort out the basic mechanisms. See, the data only gives us a description of what is going on. It cannot tell us, it cannot help us in making a decision. It cannot tell us anything about causality.

So, if we want to understand the most fundamental question which I think we can really—there's a hope that we can understand, is, what is the extent to which the local manmade influences have contributed to this tragedy. Because if it is the local factors, the manmade local factors, then there is a hope for devising suitable agricultural and land use policies.

If we can convince ourselves by very systematic analysis of data and controlled modeling experiments, that the manmade influences, there's no evidence of that playing any role, then at least we will know that it is not a question of land use and agricultural policy but we have to think about other problems.

Mr. **Scheuer**. Thank you very much.

Congressman Paul Henry of Michigan, the only missionary's son that I know of in the Congress.

Mr. **Henry**. Oh, I doubt that, Mr. Chairman.

Mr. **Scheuer**. You doubt that?

Mr. **Henry**. Yes.

Mr. **Scheuer**. Well, we're delighted you're here. It is certainly very——

Mr. **Henry**. We're not as collectively that far beyond the pale. I was particularly concerned by, I guess, Dr. Nicholson, you remarked data is even—the non-satellite data, ground-based data, land-based, station-based data is weaker than 15 years ago. And I think, Dr. Rasmusson, you were getting at that, and clearly that is something we ought to look at.

I just want to make one observation that once again, and with respect to the other members and shared concerns over the commitments that have to be made to allow your work to continue. I mean, it is remarkable now. If we have a 30-, 60-, or 90-day type prediction of a crop failure, and in one case up to a year almost in terms of by the time it became affecting market prices, it really means that there is absolutely no excuse for any kind of massive famine kind of problem if we did what we all know we can now do.

And that's a statement of fact, that with adequate grain reserves, with adequate cooperation between governments, a famine is avoidable, unless we have some global catastrophe.

I guess what strikes me is I am still trying to look at, you know, if you're running an African government, you're not that much different than a Member of Congress running the U.S. Government. You're always worried about today more than tomorrow.

Yesterday we voted a continuing budget resolution which is good for 45 days. And I suspect that about 43 days from now there will be another budget resolution, that will probably continue a little longer than 45 days.

The fact of the matter is whether you're Western leaning or Soviet leaning, aligned, nonaligned, a collectivized, a noncollectivized, whether you talk about African socialism or you don't talk about African socialism, the dynamics, the political structures in those countries, as they were in Europe 200 years ago, the French Revolution, that revolution occurs in the city. For all the instability in the African subcontinent, I don't know one revolution that came out of the countryside. So, the fact of the matter is that to govern you have to pacify the city. And one of the ways you pacify the city is keeping the price of food cheap.

And there are two ways you can have cheap food for the city. One is to develop whole new agricultural methods. But then that completely, that creates secondary problems. If the average African woman in the village is spending 6 hours pounding corn or grain, taking it to market and going home every day, 6 hours a day is typical in the harvest time, what happens if suddenly you have a different way, a different kind of maize that doesn't take as much pounding or grinding, or you simply by having an alternative crop, or you somehow have mechanized grinding or centralized delivery? First of all, you have a labor problem, which is already exasperated in terms of people flowing into the city. So, the first thing is to not allow agriculture to change, because if you allow agriculture to change, you absolutely destroy the very tenuous balance you have with the cheap food and labor control in the city.

Somehow we have got to break through that. My understanding is that that is where some massive commitments are potentially pending in terms of our government relative to these governments.

Are you dealing with some of these—as you share this information and you deal with the Department of Agriculture and AID, Department of State, do you get a sense of some of the other frustration there in trying to make that break?

Sometimes government officials, particularly across ideological and cultural barriers, can speak the language of science much better than some of the social questions here and to serve as bridges of saying, we can give you a surety of food supply if you allow us to bring in some of these other things, because my understanding is that there are some new grades, for example, the green rice that worked in Asia is simply not appropriate to the African soil and climate and water, and so forth. But alternative grains apparently are on the verge of being developed.

We are willing to make some of these commitments. But it is an absolutely phenomenal political risk for those people, no matter what their—are you involved in that process and trying to build scientific trust?

Dr. HOCK. Yes. Well, we saw it originally in a project in southern and southeast Asia, where we had a difficulty with meteorologists talking with ag economists. And once you share the methodology, how do you make sure the methodology is used? And what we have learned from the work that we did in Southern Asia is that you have to get the various ministries involved in the program from the very beginning. And that's why I stressed the multidisciplinary aspect of our project.

Our seminars are with agriculture statisticians from the agriculture ministries as well as meteorologists. And this linking of the disciplines is one way of making sure that the methodology will be used.

There is still a question of how do you get the information out to the field and how do you then do something about it in a mitigation way or in a lead-time way. And that's still something that we are going to have to continue to work on.

Mr. HENRY. I think it's not just getting the information out to the field. If, as the leader of the government of any stripe in that situation that is dependent on cheap food and urban control, that means I am controlling the price of the food in the countryside; I am paying less than market price. Which means then for the person in the village, there is absolutely no incentive to provide for more than my subsistence, because everything else is stripped off.

This is common. It is Western aligned, Eastern aligned. It's the way it works. And that's the way it was until very recently in Asia, too. Once you could get away from that so the producer could reap reward by excess production, at the same time assuring the central government that the surplus will keep the price down in the city but the villager will reap the reward of additional production, we've been able to very quickly in these countries get self-sufficiency. And very quickly the word spreads that there are other technologies. Somehow we've got to get that leap when it's a human problem, not a technical problem.

Dr. HOCK. I agree.

Mr. SCHEUER. Paul, thank you very much.

We are going to adjourn the hearing. I have a few more questions, and I am sure my colleagues will, too. I will submit them by mail to you in the next couple of days.

[See appendix.]

Mr. SCHEUER. You can see from the questions that we asked you that we do think you have provided a fundamental information base for the rest of these hearings on famine in Africa, and the effect of climate on famine, and some of the directions that we can take to alleviate the effect of famine and perhaps avoid the effects of famine.

We are very grateful to you for coming up here and for being so patient and so informative. We thank you very, very much. You will be hearing from us.

This session is adjourned.

[Whereupon, at 3 p.m., the subcommittee was adjourned, subject to the call of the Chair.]

AFRICA AND HUNGER: PROSPECTS FOR SUSTAINABLE DEVELOPMENT IN SUB-SAHARAN AFRICA

THURSDAY, OCTOBER 17, 1985

House of Representatives, Committee on Science and
Technology, Subcommittee on Natural Resources,
Agriculture Research and Environment,
Washington, DC.

The subcommittee met, pursuant to recess, at 9:50 a.m., in room 2318, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Mr. Scheuer. The Subcommittee on Natural Resources, Agriculture Research, and Environment will come to order. We will commence the second in a series of hearings on hunger in Africa. We have two very distinguished panels this morning and we should have some very interesting testimony.

We had a hearing about a month ago that evaluated the impact of climate change, and specifically the current drought on sub-Sarahan Africa, on the ability of the subcontinent to feed itself. Today we will discuss the dimensions of the population problem that faces this region and the prospects for achieving some kind of fertility decline, which seems to be indispensible to bringing into equilibrium food and people.

Now just as climatic variation and the recurrence of drought set one type of limitation on development in this region, the tremendous population growth in the nations of sub-Saharan Africa will also set real limitations of development and will set the future course of development for these countries, for better or for worse. It is a truism to say that Africa's population growth rate is the highest in the world, and it continues to accelerate.

We are welcoming one of our most active and contributing members of this subcommittee, Congresswoman Jan Meyers of Kansas. Welcome, Jan.

Experts predict that in 20 years from now there will be a second Africa, equal to the size of the current Africa, of about 435 million—a second Africa. In other words, in two decades with a population growth rate of a little over 3 percent a year, sub-Saharan African population will double. Now what will this mean for the continent?

Well, first of all, it will mean that they will move further and further away from food self-sufficiency that they enjoyed a generation ago, when they were about 95 percent food self-sufficient. Now food imports account for about one-fifth of the region's cereal. As much as 60 percent of the population of sub-Saharan Africa is chronically malnourished.

In order to sustain these current levels of nutrition—obviously inadequate, painfully inadequate by our standards—the sub-Saharan African countries will have to import between 35 and 40 percent of their food requirements by the end of the century, which is about double the 15 to 20 percent that they are importing now. By that same time, rudimentary—the bare essentials—of education and health services will consume over half their budget for most of the countries in sub-Saharan Africa—again, double the current percentage share of education and health services in their budget, so that any development effort for this region in terms of jobs, housing, farm-to-market roads, and the rest must take into account the enormous costs of importing a majority of their food and the enormous costs of providing for the increased education and health needs of this new, young population.

The issues that I am discussing will be explored, incidentally, in detail this May—May 1986—in a conference that has been organized in Harare, Zimbabwe, by the Global Committee of Parliamentarians on Population and Development, an organization of which I have the honor to serve as chairman of the board. At this conference, African leaders will look into the future in an attempt to find ways to balance resources and population by increasing food production in a whole variety of ways and by getting a handle on their population explosion, by moderating both desired family goals and actual fertility levels.

Now this committee will have several days of hearings on increasing agricultural production, which is certainly a component of hunger in Africa. This will take place on October 23, October 30, and October 31. Today we are addressing the population component of that equation. We will have testimony here from two very distinguished panels. They will address several major elements.

First, how do we formulate programs designed to address the means of reducing desired family size, of altering family size goals? How do we do it? How quickly do these goals change? Second, how do we actually reduce fertility, once we have created the incentive to reduce family size goals? A recent world fertility survey indicates that there is an enormous unmet demand for family planning services in most areas of sub-Saharan Africa. I myself have seen city after city and rural area after rural area where, when a family planning clinic is opened—either a free-standing family planning clinic or a clinic within a maternal and child health service context—the line of young couples and young women waiting to be served stretches out unto the horizon.

So providing the means to control fertility by increasing the availability and variety of contraceptives—of contraceptives that are cheap, that are safe, that are easy to use, that are long lasting, inexpensive—is one area where foreign aid in general and our own country's foreign aid, with the help of that really dynamic research and development capability in our universities and our research institutions and our pharmacological industry, where we can play a dynamic role. These are some of the issues that we will discuss here today.

Before we commence hearing from the first witnesses, I would like to recognize the ranking Republican on this committee, the Honorable Claudine Schneider of Rhode Island, who was a leading participant in the recent United Nations Conference on Women held in Nairobi. Perhaps in the course of the morning we will get some questions and some remarks from Congresswoman Schneider based on her experience there.

Congresswoman Schneider.

Miss **SCHNEIDER**. Thank you, Mr. Chairman.

I am delighted that we are taking this opportunity today to focus on some of the human dimensions of the African hunger problem. I am hopeful that everyone who was in attendance at this hearing today was aware that yesterday was World Food Day and that all of you perhaps participated in the effort in acknowledging what World Food Day means, not only to this country but also throughout the world. I think that population projections certainly lead us to enormous concerns about what the food situation may be in the future.

But, needless to say, having had the opportunity to recently visit Kenya and to witness firsthand some of the challenges that an increased population is presenting, I think that it is imperative that we analyze and very closely look at the situation, and see if we can offer some information in the way of a remedy. The fact that Kenya's population growth is 4 percent annually—one of the highest in the world—is rather devastating. When you recognize that they have approximately 20 million people in that country now and the population will double in the next 17 years, it is hard to fathom, particularly when two-thirds of the country is already desert, leaving only one-third productive to produce foods for feeding the growing population.

So, needless to say, there are enormous food demands and stresses on environmental resources, but throughout sub-Saharan Africa there is the annual population growth rate, 3.5 percent, up from 2.5 percent in the 1960's. Now this growth rate is the highest in the entire world, and it also happens to be the highest in the history of mankind so, needless to say, considering that Members of Congress usually react when a crisis occurs, I think that as we look at these statistics we can very rapidly recognize that we are looking a crisis right in the face at this time. When we acknowledge the fact that other rates have been falling, such as the death rates, although they are still very high, all of these points factored in lead us toward some type of policy conclusions.

Pressures have affected every aspect of African life, in the homes, the villages, throughout the various regions of sub-Saharan Africa, and they have exacerbated economic problems and also social problems. There is very little question that our country has a growing interest and concern for the population and the environmental resource problems of the developing world. This stems not just from humanitarian and environmental values, because those are certainly high on our priority list as a nation, but they also are important to the U.S. economy and to national security interests, so I am delighted that the chairman has agreed to hold these hearings today and I look forward to our panel of expert witnesses. Being familiar with the work of many of them, I think that certainly when we put all of this brainpower together, we ought to be able to come up with not just a clear analysis of the problem but perhaps some positive recommendations for solutions.

Thank you, Mr. Chairman.

Mr. SCHEUER. Thank you.

All right. Let's invite the first panel to come up to the witness table: Michael Teitelbaum, program officer for the Sloan Foundation and formerly Executive Director of the Select Committee on Population of the U.S. Congress; Ambassador Marshall Green of the State Department, formerly Ambassador to Indonesia and Australia and roving Ambassador Plenipotentiary on population matters. Marshall Green, will you come up to the witness table?

Stephen Isaacs, director of the Development Law and Policy Program in the Center for Population and Family Health at Columbia University; and Werner Fornos, president of the Population Institute.

All right. Why don't each of you speak to us informally? Your entire prepared statements will be reprinted in their entirety at this point in the record. I would ask you to address us informally as if we were sitting in a living room together, hitting the highlights of your testimony.

Before we begin the testimony, I must apologize for my egregious carelessness in failing to recognize Congresswoman Jan Meyers of the State of Kansas. I ask unanimous consent that any remarks she might make will be placed right after Miss Schneider's remarks.

Mrs. MEYERS. Very briefly, Mr. Chairman, just think that I'm very pleased that we're having these hearings. Population is certainly one of the most important problems that we address. We can't think about sustained growth and achievement when people are hungry and ill-housed, so just for the good life for people and for the possibilities of a peaceful world, the pressures that excess population brings which lead to hostility and confrontation between nations, I am very pleased that we are addressing the problem and that we are hearing from these good people.

Thank you.

Mr. SCHEUER. Thank you very much.

All right. Taking you in the order in which we requested you to come up—and I would suggest you take approximately 7 or 8 minutes, and then we'll have time to question all the witnesses when they have all finished—Dr. Teitelbaum.

STATEMENT OF DR. MICHAEL S. TEITELBAUM, PROGRAM OFFICER, ALFRED P. SLOAN FOUNDATION

Dr. TEITELBAUM. Thank you, Mr. Chairman. May I say it's good to be back here on Capitol Hill, particularly on such a nice morning.

The request of the subcommittee staff to me was to speak about demographic change in sub-Saharan Africa as it may be compared and contrasted with change in other world regions. These subjects are prone to exaggeration and to misunderstanding. I would like to highlight briefly for you six such comparisons which seem to me to be worthy of the committee's attention.

The first—and the chairman and members of the committee have already mentioned this, so I will be very brief—the first and most important thing about sub-Saharan Africa, demographically speaking, is that it is in the very early stages of the demographic transition, the transition from high levels of fertility and mortality in steps down to low levels of fertility and mortality.

In most countries that have gone through the demographic transition, mortality has declined first and then there has been a variable lag with fertility decline, resulting in rapid population growth. All of the industrialized world has gone through both stages of decline. Both variables have declined. In some cases these fertility declines have been very dramatic, very rapid, the most extraordinary of all being that of Japan after World War II, and the second most extraordinary being the People's Republic of China in recent years. It is important to note that in both these cases, and indeed in most cases of postwar fertility declines, government policies have served to accelerate and expedite the demographic trends.

Sub-Saharan Africa is a notable exception to what I have just said. There have been declines in African mortality, although mortality levels are still unconscionably high in many of these countries, and indeed higher than in the rest of the world. Meanwhile, there has been little or no decline in fertility rates. In some cases there have actually been increases in fertility rates in some countries in sub-Saharan Africa.

The result has been that sub-Saharan Africa is the only one of the world's developing regions that has not experienced a decline in the rate of natural increase—that is, simply the difference between birth rates and death rates—and in fact, if anything, this rate in sub-Saharan Africa has increased, from about 2.7 percent in 1965 to 3.1 percent in 1980 and probably higher now. As a result, sub-Saharan Africa is experiencing the highest rate of natural increase of any world region, as a member of the committee has already pointed out.

A second important characteristic that differentiates sub-Saharan Africa from much of the rest of the world is its relatively sparse population density, if one compares population to land area. For example, in sub-Saharan Africa this crude measure of population density is less than one-fifth that of Asia, which is very densely populated. The Food and Agriculture Organization has done a careful study of land resources in Africa, and argues that there are substantial potential resources for food production in sub-Saharan Africa that would allow the continent or subcontinent to support a substantially higher population than it had at the time of the study in 1975.

This is a very attractive conclusion. In fact, it's a necessary conclusion because, as I shall say in a moment, sub-Saharan Africa will indeed, barring catastrophe, have such substantial increases in its population. There are some very favorably endowed countries in sub-Saharan Africa that are very sparsely populated and have tremendous potential for supporting larger populations. There are others that are exceeding their capacity to support their populations already.

The third important differentiating factor about sub-Saharan Africa is its very low level of urbanization compared to most of the rest of the world. Just under one-third of the population of the subcontinent was thought to be living in urban areas in 1985. The only regions with lower percentages than that are in south Asia and east Asia, excluding Japan.

To compare sub-Saharan Africa, for example, to Latin America, there were 69 percent urbanized in Latin America, 74 percent in Europe and North America, versus about a third in sub-Saharan Africa. The projections of the United Nations and other organizations as to the future of African urbanization trends suggest that Africa will continue to be on the low side of current experience. For example, the U.N. projection is that about 42 percent of the population would be urban resident in the year 2000.

There is an interesting fact that will possibly be mentioned by other witnesses about urban populations in sub-Saharan Africa, which is that by all reports from policymakers and political leaders, it is the urban population that is the source of political instability for them, the source of political threat. It is for this reason that many countries in this region have kept down prices for food paid to the farmers of these countries. The result has been improverishment for the farming populations, a reduction, if anything, in food production, and certainly incapacity to raise per capita food production and a tendency to accelerate rural-to-urban migration.

A fourth important aspect of African demography has to do with its age structure, which is itself a direct consequence of high fertility—that is, a remarkably large percentage consisting of children. Over 45 percent in 1980 were under the age of 15. This is by far the highest for any world region. Projections done by the United Nations show this very high percentage of children continuing through the year 2000 at least, given the fact that no one anticipates very rapid declines in fertility in sub-Saharan Africa.

It goes without saying in this body that such age structure factors have important political implications for any government leader. They affect the demand for national expenditures on education and other such services that are keyed to children and to youth, and this is especially true in a region in which low percentages even today have access to education.

The flip side of this very youthful population is a very small percentage of elderly persons in African populations, both today and as projected to the year 2000. The 1980 estimate is only 3.1 percent 65 and over, and this makes it a very substantially lower percentage than any developed country one could think of.

The fifth point I wish to bring before you has to do with this age structure, and it is the enormous demographic momentum that resides within the age structure of the sub-Saharan African population. Demographic momentum is the tendency of populations to continue to grow for 40 years or 50 years or 60 or more years after they have experienced substantial, even dramatic, declines in fertility. The only physical analogy that is earthbound that one can think of, of this kind of momentum, is the problems faced by the captain of a supertanker when he wishes to stop or to turn. He has to plan his turns or halts several hours in advance of when he actually wishes to stop. In the case of population change the momentum factor is longer than almost anything that one can imagine, other than outer space.

This has profound implications for the future of Africa but they are not well understood, in my experience, by many of those who have policymaking roles on that continent. The most recent U.N. projections, which I should emphasize all include rather optimistic assumptions concerning fertility declines in sub-Saharan Africa—they are assuming fertility declines that have not appeared yet in some important countries of sub-Saharan Africa—in any case, these projections show that the 1985 African population, taking the continent as a whole, of just over 550 million, would be expected to rise nearly 200 percent by 2025 to 1.64 billion.

Mr. SCHEUER. Did you say 550 million?

Dr. TEITELBAUM. That's for the whole continent of Africa, not sub-Saharan Africa, yes.

The World Bank's projections for Nigeria, which is an important—perhaps the most important—country of the region and worth looking at in particular, give three alternative projections for that single country, depending upon the rapidity of future fertility and mortality declines. The standard World Bank projection, which is based on a continuation of recent mortality trends—improvement thereof—and nearly immediate initiation of a fertility decline that has not yet shown any sign of occurring, shows that the Nigerian population would rise from about 90 million, say—no one really knows—in 1982 to 470-plus million in 2050. There are two variants given by the World Bank that involve more rapid fertility declines, and these show ultimate or 2050 populations in the range of 240 to 265 million.

Now the main point to be noted here is that, even with rapid fertility declines, the momentum factor in Nigerian population growth can be expected to double or triple the size of its population. Barring catastrophe in Nigeria and indeed in the whole subcontinent, this area is likely to have—Nigeria in particular will have—a population as large as that of the U.S.S.R. or the U.S.A. today.

My experience in pointing this out to Nigerian officials is that they find it very hard to believe. That is, they believe—quite appropriately, perhaps—that the potential of the Nigerian land mass and resource base is such that it can support a much larger population, and indeed they would welcome a larger population. What they have not—some of them, at least—absorbed is that they will have that larger population. It has nothing whatever to do with whether or not fertility declines are initiated now. No matter what happens, they will have a doubling or tripling of the Nigerian population. The question is, how much beyond that doubling or tripling or quadrupling will the size of the population go?

This raises an important positive aspect to the sub-Saharan situation as compared to other world regions. The countries of this region have an opportunity to take decisive action now in anticipation of future problems. In this respect they compare favorably to South Asian countries such as Bangladesh, where such foresight is no longer a possibility.

Finally, there is a sixth important and depressing quasi-demographic fact about sub-Saharan Africa. It is that it is the continent of refugees par excellence. According to the U.S. Committee for Refugees, a responsible reporter on these subjects, there were in

1984 some 2.5 million refugees in need of assistance in sub-Saharan Africa, many of them in refugee status for many years. There is one world region that has larger numbers of refugees than sub-Saharan Africa. It is the Middle East and South Asia, but its numbers are due principally to the 3.3 to 4 million refugees who have departed Afghanistan since the Soviet military intervention in that country.

So let me summarize, Mr. Chairman, by saying that in demographic terms sub-Saharan Africa is indeed an outlyer. It is a region in which mortality conditions have improved but that has yet to experience significant fertility declines, and that consequently is experiencing the most rapid population growth of any world region. This means it has an exceptionally youthful age structure and a powerful, in-built momentum for future population growth.

There are some fortunate nations in the region that have substantial potential for economic development to meet the needs of their rapidly growing populations. There are other less fortunate countries that do not have this potential. Meanwhile, there are very large numbers of African refugees in need of assistance. The prospects for the future are for very large increases in sub-Saharan populations and an enormous reservoir in the rural areas of potential migrants to urban settings, with all the political and economic consequences that implies.

In my judgment, Mr. Chairman, the future of the continent will be significantly affected—by no means the only factor, I should emphasize that—but significantly affected by the degree to which its governments are willing and able to cope with the demographic trends that seem to be near certain, barring catastrophe. In addition, in view of the long-term momentum of demographic change, much will depend upon their foresight, upon willingness and competence among African leaders to undertake judicious measure in the near future that might have moderating effects on demographic change over the very long term.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Teitelbaum follows:]

Michael S. Teitelbaum 10/17/85

TESTIMONY ON DEMOGRAPHIC CHANGE IN SUB-SAHARAN AFRICA
BY
MICHAEL S. TEITELBAUM

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH
AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
OCTOBER 17, 1985

MR. CHAIRMAN, LADIES AND GENTLEMEN:

I am Michael S. Teitelbaum, Program Officer at the Alfred P. Sloan Foundation in New York. I am a demographer by profession, and served previously as Staff Director of the House Select Committee on Population. It is good to be back here on Capitol Hill, where I am appearing at your invitation and in my personal capacity.

I have been asked by this Subcommittee to speak about demographic change in sub-Saharan Africa as it may be compared and contrasted with change in other world regions. Six such comparisons seem to me to be worthy of the attention of this Committee.

The first and most important thing to remember about sub-Saharan Africa is that it is still only in the initial stages of the "demographic transition" --- that fundamental transformation of human societies in which high levels of mortality and fertility are reduced to low levels. In most countries that have gone through this transition, mortality levels have been first to decline under the impetus of improved nutrition, sanitation, and health care. This leads to a sometimes very lengthy period of low or declining mortality while fertility levels remain high. The obvious mathematical outcome is rapid population growth.

All of the industrialized world, and important parts of the developing world, have now moved into the next stage, in which fertility levels have at least begun to decline toward levels levels that are compatible with low mortality. In some cases, these fertility declines have been very rapid indeed: the most rapid was probably that of Japan after World War II, followed by

China in recent years. In most postwar fertility declines, policies adopted by governments have served to encourage or accelerate the trends.

Sub-Saharan Africa is a notable exception to the above generalizations. There have been declines in African mortality, although mortality levels are still higher than in the rest of the world. Thus, although the crude death rate in sub-Saharan Africa has declined from 22.8 in 1965 to 17.7 in 1980, this is still the highest rate of any world region, higher even than that of South Asia at 14.5 in 1980.

Meanwhile, there has been little or no decline in African fertility rates, while other world regions have shown more or less significant fertility reductions. For example, the birth rate in China has declined from 42.8 in 1965 to 18.5 in 1980; in East Asia (excluding China) from 42.1 to 33.3; in South Asia from 45.4 to 36.8; in the Middle East and North Africa from 45.8 to 40.0; and in Latin America and the Caribbean from 39.2 to 33.5. In contrast, the change in sub-Saharan Africa had been only from 49.4 to 48.8, and given the poor quality of fertility data in this region such a change is well within the range of estimation error.

As a result, sub-Saharan Africa is the only one of the world's developing regions that has not experienced a decline in the rate of natural increase. Indeed, this rate in sub-Saharan Africa has if anything _increased_, from 2.7% in 1965 to 3.1% in 1980. At this 3.1% estimated rate, sub-Saharan Africa was experiencing the highest rate of natural increase of any world region.

A _second important characteristic_ differentiating sub-Saharan Africa from much of the rest of the world is its sparse population density. For example, the average population density of sub-Saharan Africa is less than 1/5 that of Asia. A careful study of such issues, along with the potential for food production, has recently been completed by the Food and Agricultural Organization (FAO), entitled "Land Resources for the Future". This study took into account soil and climatic conditions and levels of farm technology around the world, and compared them to current and projected populations. Over all, the FAO calculations for Africa indicate that with current farming methods there is sufficient land to provide food for a continental population 170% larger than the 1975 population of Africa. However, when Africa is broken down into component countries, of the 40 sub-Saharan countries, 14 are shown to be unable to sustain their 1975 populations (Botswana, Burundi, Ethiopia, Kenya, Lesotho, Malawi, Mauretania, Numidia, Niger, Nigeria, Ruanda, Senegal, Somalia, and Uganda). These 14 countries account for approximately half of the sub-Saharan African population. There are, however, 11 countries possessing extensive underused land according to the FAO. For example, Gabon, the Congo and the Central African Republic are estimated to have been capable of supporting more than 20 times more population than they had in 1975. These favorably endowed countries count for about 30% of sub-Saharan African land area but only about 1/5th of its population.

A third important differentiating factor about sub-Saharan Africa is its very low level of urbanization compared to the rest of the world. For example, in 1985 for the whole of the African continent, just under 1/3 of the population was thought to be living in urban areas. The only regions with lower percentages are the developing regions of South Asia and East Asia. Meanwhile, 69% of Latin America was estimated to be urban in the same year, and 74% in Europe and Northern America. Available projections suggest that African urbanization may continue to be on the low side of current experience, with 42.2 percent urban projected for the year 2000. [Source: United Nations, Concise Report on the World Population Situation, 1983, New York 1984, Table 25.]

A fourth important aspect of African demography has to do with its age structure. As a direct consequence of high fertility, a remarkably large percentage of the African population consists of children: over 45 percent were under age 15 in 1980, the highest for any world region. U.N. projections show this high percentage continuing through the year 2000, given that substantial declines in African fertility are not anticipated. Such age structures have important implications for the demand for national expenditures on education and other services keyed to children and youth, especially given the low base of education availability in most African countries. The flip side of this "youth" population component is the small percentage of the elderly in African populations, both today and projected fo 2000: the 1980 estimate is only 3.1 percent 65 years of age and older, declining slightly to 3.0 percent by 2000. (For comparison, most industrialized countries including the U.S. have 10-15 percent aged 65 and over.)

In addition to its implications for provision of education and other services, the age structures characterizing African countries are the source of their enormous demographic "momentum" --- the tendency of populations to continue to grow for 40, 50, 60 years after they experience substantial fertility declines. This longlasting momentum arises from the fact that even if the current child population when it reaches maturity has fertility comparable to the low levels of the industrialized world, the large numbers in these age groups mean that large numbers of children will continue to be born for at least a generation.

This momentum characteristic has profound implications for the future of Africa, but these are not well understood by many of those dealing with that continent. The most recent U.N. projections, which include assumptions of fertility declines, show the 1985 African population of just over 550 million rising by nearly 200 percent, to 1.64 billion by 2025. The World Bank's projections for Nigeria, by far the largest sub-Saharan African nation, give three alternative projections depending upon the rapidity of future fertility and mortality declines: the "standard" projection based on continuation of recent mortality trends and near-immediate initiation of fertility decline, shows the 1982 Nigerian population rising from 91 million in 1982 to 471 million in 2050. Two variants involving more rapid fertility declines show increases to 243-265 million by 2050. The main point to be noted is that even with rapid fertility declines, the momentum of Nigerian population growth can be expected to double or triple its size; barring catastrophe, Nigeria seems likely to have a population as large as that of the USSR or USA today. The other point worthy of note is how large a difference in eventual population size is determined by the rapidity of the fertility decline --- ranging from 243 million to 471 million in the Nigerian case.

Finally, there is a sixth important (and depressing) quasi-demographic fact about sub-Saharan Africa: it is a continent of refugees par excellence. According to the U.S. Committee for Refugees, there were in 1984 some 2.5 million refugees in need of assistance in sub-Saharan Africa, many of them in refugee status for many years. The only world region with larger numbers is the Middle East and South Asia, due principally to the 3-4 million refugees who have departed Afghanistan since the Soviet military intervention in that tragic country.

To summarize: in demographic terms sub-Saharan Africa is an "outlyer" --- a region in which mortality conditions have improved but that has yet to experience significant fertility declines, and that consequently is experiencing the most rapid population growth of any world region. High fertility means that sub-Saharan Africa has an exceptionally youthful age structure and a powerful "momentum" for further population growth. Some nations in the region have substantial potential for economic development to meet the needs of their rapidly growing population, while others do not. Meanwhile there are very large numbers of African refugees in need of assistance. Prospects for future are for very large increases in sub-Saharan populations, with an enormous reservoir in rural areas of potential migrants to urban settings.

In my judgment, the future of the continent will be significantly affected by the degree to which its governments are willing and able to cope with the demographic trends that seem near-certain (barring catastrophe). In addition, in view of the longterm momentum of demographic change, much will depend upon the willingness and competence of African governments to undertake judicious measures in the near future that might have moderating effects on demographic change over the very long term.

THANK YOU FOR YOUR KIND ATTENTION.

Mr. **Scheuer**. Thank you very much, Dr. Teitelbaum.

I will encourage all of the three remaining witnesses not to read their testimony, just to speak to us from the heart for about 8 minutes. All of your testimony, as I said, will be reprinted in full at this point in the record.

Ambassador Marshall Green.

STATEMENT OF HON. MARSHALL GREEN, FORMER AMBASSADOR TO INDONESIA AND AUSTRALIA

Ambassador **Green**. Mr. Chairman, I want you to know that, although yesterday was World Food Day, that I went lunchless preparing this testimony, so devoted am I to the cause that you have so well spearheaded in the Congress. [Laughter.]

Mr. **Scheuer**. Thank you.

Ambassador **Green**. It is also characteristic of my thoughtfulness that, although I was asked to be the leadoff witness, I asked that Mike Teitelbaum lead off because I thought that the basic demographic facts of life were ones that should be laid out clearly, as Mike has done so well, before I got into the subject of my discussion, which will be largely on the economic and sociopolitical implications of rapid population growth which I was asked to cover.

Sub-Saharan Africa is the only area in the world where national economic growth rates are usually negative, where per capita food production is declining——

Mr. **Scheuer**. Do you mean the growth rates are negative, the sum total growth rates, or the per capita growth rates?

Ambassador **Green**. I'm talking about, well, either one, as a nation or as a per capita basis. I'm talking about the economic growth.

It is the continent where nutrition, literacy, and life expectancy rates are lowest. Today, according to the State Department reports, Africa faces an economic crisis that threatens the stability of key governments friendly to the United States, adds to the burdens of an already overtaxed international financial system, and inflicts hardship on millions of Africans. Nigeria, for example, its foreign exchange is now greatly reduced by loss of income on oil, and today is devoting about half of its foreign exchange resources to debt servicing, with about half of the remainder being devoted to food imports—that for a country that at one time was self-sufficient in food. In short, Africa is becoming even poorer and more desertified, with further deterioration I fear being almost certain.

Now the causes of this tragedy are many and complex: Unfortunate economic policies, neglect of the agricultural sector, mismanagement, shortage of trained manpower, dependence on one or two key exports, a difficult environment and, above all, excessively rapid population growth. Indeed, fertility rates are the highest in the world, as Mike pointed out. Africa is a continent where, I fear, there is the least amount of continence being practiced.

Now from a socioeconomic or a sociopolitical viewpoint one of the most serious effects of high population growth in the area is the mass movement of people from rural areas to towns and cities. Although, as Mike says, Africa is basically a rural continent with the least amount of urbanization, nevertheless in recent years urbanization processes have gone up very, very rapidly. Masses of people are swarming off already overcrowded rural areas, where land fragmentation goes on and where underemployment is massive, and they are moving into already overcrowded cities.

Take Kenya, for example. I met with members of the Kenyan Economic Planning Office in Nairobi in 1980, and there I learned that their deepest concern was over pressures of people on land and the fact that Kenya had no more land frontiers. "We cannot," said one official, "produce more than 50,000 new jobs per year," whereas there are 250,000 new entrants into the job market each year. In other words, repeat only 20 percent of the young men can find jobs, and the rest, he said, are condemned to be unemployed in the cities or to remain greatly underemployed in the rural areas. "It is the unemployment picture that most alarms our planners, and we have no answers, or at least we have no immediate answers."

Now Africa has adopted or tried to adopt measures that would deal with this urban overcrowding. Nigeria's planned new capital city, Ajuba, is largely motivated by a desire to defuse the explosive growth of Lagos. Kenya's policy is to promote market towns all over the country; and, of course, as you know, President Nyerere in Tanzania has gone in for a villagization program called Ujimaa which had, as one of its objectives, to try to lessen the flow of people into Dar-es-Salaam and other cities. But none of these programs have worked out very well and I doubt if they will, because it does call for a degree of authority which I fear is lacking in most of these countries to carry out, as well as an enormous amount of financing which they lack.

Now Africa has been very slow in countermeasures to deal with their total population program. Traditionally, fertility has been limited by high infant mortality rates—or counterbalanced, I should say—and by infertility and by traditional fertility control measures, as well as the separation of the sexes before and sometimes after marriage, certainly after the birth of a child, and by a pattern of polygamy which results in fewer children per woman due to the spacing of pregnancies.

As the winds of change blow over Africa, traditional mechanisms for dealing with these problems that have sprung up independently throughout the continent are now breaking down, without there being substituted modern fertility control measures. Meanwhile, foreign aid, especially in the fields of food and health services, is causing death rates to plunge without any commensurate drop in fertility rates. In other words, our help and bounty ofttimes, unless compensated by a great increase in the fertility control measures, is simply going to add to the long-range problems of population growth.

As recently as 1974, when the U.N. Population Conference was held in Bucharest, there were only two countries in sub-Saharan Africa that had population programs. They were Ghana and Kenya. Today there are some 13 that have such measures, and I would say that opinion by and large in Africa today is more receptive to family planning and to population programs in general. Hysteria over so-called genocide has disappeared. People realize that food is inadequate to match population growth. Poverty, unemployment, and other problems are forcing governments to address the population issue.

However, the problems of introducing effective countermeasures are legion. Continuous changes of government make it most difficult, if not impossible, to have a sustained program in population or in many other fields as well. Leaders everywhere tend to be most concerned with immediate issues, and population unfortunately is one of the longest-range. Furthermore, there is very little political benefit in population programs. Oftentimes one runs risks with religious leaders and traditionalists and bigots and others, in trying to introduce population programs, and so leaders tend to stand back from dealing with this problem, much as they recognize its severity. Oh, yes, they make fine declarations. Declaratory support is great. But in terms of implementing measures, I'm afraid that they are very short.

Overall the problem comes down to this issue of the age-old desire of parents in the developing world—especially husbands, who are far less responsible than their wives—to have many children, an average of six in Africa, among whom there is a strong preference for boys. In the final analysis this is the most difficult obstacle in dealing with the problem, much as the introduction of modern family planning services and their extension and availability for all people is important, much as it is important to increase their education and many other things.

So the problem of motivation is not going to be solved by conventional IEC techniques or the availability of modern contraception, as I say, essential as they are. What is involved here is changing a whole continent's way of thinking. This will involve economic growth and modernization, advancing women's status, rights, and the employment of women, vastly improved communications and travel and, above all, education and job opportunities. Yet Africa's worsening economic and sociopolitical scene makes the achievement of these goals most difficult.

In any case, it's a time when we should be doing all possible here in America and in other countries to encourage and support Africa in its efforts to deal with excessive population growth. Clearly it's not a time when we should go about cutting funds for IPPF, as we have, and now where funds for UNFPA are imperiled. It is a sobering thought to consider that the African countries turn to UNFPA perhaps as they do to no other source for assistance in the whole population field.

Mr. Chairman, I'll stop at this point. Thank you very much.

[The prepared statement of Ambassador Green follows:]

SOCIO-POLITICAL IMPLICATIONS OF RAPID POPULATION GROWTH IN SUB-SAHARAN AFRICA

Statement to the Hearing on Africa and Hunger: Population
by the Subcommittee on Natural Resources, Agriculture Research
and Environment, Committee on Science and Technology
James H. Scheuer - Chairman

Marshall Green, Ambassador (Ret.)

October 17, 1985

Mr. Chairman:

My concern with population issues derives from a 40 year career in the American Foreign Service in which I had assignments in countries like Korea and Indonesia where excessive population growth was clearly the most serious long-term problem which those countries faced. I accordingly resigned in 1975 as American Ambassador to Australia to become the State Department's first Coordinator of Population Affairs and Chairman of the Interagency Task Force on World Population Issues (under the National Security Council), as well as Chairman of the U.S. Delegation to the UN Population Commission in 1977 and 1979.

Upon reaching the mandatory retirement age in 1979, I devoted my remaining years to population issues as a volunteer working with the Population Crisis Committee while continuing as a consultant on population and refugees to the State Department.

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Sub-Saharan Africa is the only area of the world where national economic growth rates are usually negative and where per capita food production is declining. It is the area where nutrition, literacy and life expectancy rates are lowest. A continent which was essentially self-sufficient in food production 20 years ago now imports 20% of its cereal requirements, involving a 9-fold increase in its cereal bill over the last decade. Nowhere in the world is environmental deterioration more widespread and devastating than in Sahelian Africa - all the way from Senegal on the West to Ethiopia on the East.

Today, according to a State Department report, Africa faces an economic crisis that threatens the stability of key governments friendly to the United States, adds to the burdens of an already overtaxed international financial system and inflicts hardship on millions of Africans. About one-half of Nigeria's foreign exchange earnings, greatly reduced by the fall in oil prices, is now devoted to debt servicing, with most of the remaining Fx committed to food imports.

In short, Africa is becoming ever poorer, with a further deterioration almost certain.

The causes of this tragedy are many and complex: Unfortunate economic policies, neglect of the agricultural sector, mismanagement, shortage of trained manpower, dependence on one or two export commodities, difficult environment, and above all, excessively rapid population growth.

The world has been slow in wakening to the disastrous consequences of Africa's population growth - by far the highest in the world. For example, the Club de Sahel (an international club of donor and recipient countries and international organizations) prepared a report in 1976 which drew attention to the serious ecological threats to the Sahel, pointing out how the Sahel's fragile equilibrium was being undermined by population growth and by the concommitant increase in herd size which resulted in overgrazing and desertification. However the Club de Sahel's strategy for dealing with this ecological disaster-in-the-making made no mention of the need to control population growth. In fact the plan discussed how to increase the size of grazing herds required by growing human populations.

From a socio-political viewpoint the most serious effect of high population growth in the area is the mass movement of people from rural areas to towns and cities. Although all African countries except South Africa are overwhelmingly rural, the increase over the past 15 years in the proportion of their populations living in urban areas exceeds all but the oil states of the Persian Gulf. Between 1970 and 1982, sub-Saharan African urban populations grew on an average of 6% annually, about twice the overall rate of population growth.

As Professor Fred Sai of Ghana points out, urbanization in Africa is more frequently a "push" phenomenon than a "pull" one. Thus, the majority of migrants are not being pulled in by the availability of employment as happened in Europe during the Industrial Revolution, but they are trying to escape from the poverty and desperation of rural living conditions where land holdings are ever more fragmented. Migrants into urban areas are at best underemployed, but usually unemployed, creating high crime rates in the shanty towns in which most must live.

Take the example of Kenya, one of africa's leading nations and one where the United States has special strategic interests.

When I met with members of Kenya's Economic Planning Office in Nairobi in May 1980, they expressed deep concern over the pressures of people on land and the fact that Kenya had no more land frontiers. "We cannot," said one official, "produce more than 50,000 new jobs per year, whereas there are 250,000 new entrants to the job market each year." In other words, only 20% of the young men can find jobs. The rest, he said, are condemned to remain in rural areas without adequate means of livelihood or to be unemployed in the cities. "It is the unemployment picture that most alarms our planners. We have no answers," he added.

Of even greater concern to Kenya's leaders is the socio-political unrest brought on excessive population growth which is forcing many people to leave their tribal homelands. Ethnic tensions grow as squatters encroach on the lands of neighboring tribes. Likewise, urban migration forces people of different tribes to live in unaccustomed proximity, vying for the same scarce jobs. All these tensions and conflicts are further aggravated by the proximity of wealth to poverty in the bigger cities, especially the capital cities.

I refer specifically to the way the urban poor are jammed into shantytowns deprived of adequate water, sanitation, health, transportation and other services, with many dwelling 5, 6 or more to a room, yet living in visible proximity to the privileged (and often corrupt) few with their mansions, apartments, automobiles and well-stocked stores. Despite such conditions and the envy and appetites they create among the poor, most rural migrants are not immediately a threat to political stability because they may feel better off than in the villages they left. But their numerous offspring are not so well satisfied. Political tensions build-up as the second-generation migrants confront the reality of continued urban poverty and high unemployment. Thus there would appear to be building up in some of the bigger cities a major potential source of upheaval.

Rapid urban growth is not only due to high in-migration but also to high rates of natural increase (births minus deaths). This is especially true where migrants to cities include lots of young people entering their fertility years.

Some African governments have adopted policies that attempt to spread this massive urban growth about the country. Nigeria's planned new capital city of Ajuba is largely motivated by a desire to diffuse the explosive growth of Lagos. Kenya's policy is to promote market-towns throughout the country to reduce pressures on Nairobi and Mombasa.

These policies have not been effective to date - nor are they likely, even if moderately successful, to cope adequately with the overall internal migration problem. Attempts to hold down food costs in the cities - to placate the urban poor - can result in depressing farm prices, thus creating disincentives to farmers, the loss of food production and an increase in imported foods.

Thus, in the case of Kenya, food imports are at record levels and costs, and with the falling world price of tea and coffee, Kenya's main exports, Kenya is in a serious financial bind.

It is small wonder that Africa is plagued with unrest, forced migrations and military coups.

Africa has been alarmingly slow in taking countermeasures. Traditionally, fertility has been limited by: 1) high infant, child and maternal mortality, 2) infertility resulting from untreated infectious diseases, poor nutrition, etc., and 3) traditional fertility control methods including sexual prohibitions during nursing periods of 2 years, enforced virginity before marriage and strong sanctions against extramarital sex, physical seperation of the sexes before and (to some extent) after marriage, abortion and infanticide, use of herbal medicines or implants to prevent pregnancy, and a pattern of polygamy which results in fewer children per woman due to spacing of pregnancies.

As the winds of change blow over Africa, traditional mechanisms of fertility control are breaking down, but without their being substituted in most countries by modern methods of birth control. Africa's colonial past has also left its mark especially in Francophone Africa where French law prohibiting all forms of contraception applied. More importantly, there seemed at first to be no threat of overpopulation since almost all African countries had wide open spaces. People wanted large families for any number of reasons, some of them valid (to care for their parents in their old age and to do the many back-breaking chores on the farms including hauling water, weeding, and collecting firewood) and some invalid (influence of macho husbands and traditionalism).

As recently as 1974 when the UN Conference on Population was held in Bucharest, only two countries in sub-Saharan Africa - Kenya and Ghana - had policies to deal with population growth. By mid-1984, 13 countries had such policies, the additional countries being Botswana, Burundi, Gambia, Lesotho, Nigeria, Rwanda, Senegal, Uganda, Zambia, Zimbabwe and South Africa.

Opinion, by and large, in Africa today is more receptive to family planning and to population programs. Hysteria over "genocide" has disappeared. People realize that food is inadequate to match growth. Poverty, unemployment and other problems are forcing governments to consider measures to stabilize population growth, including involvement of the private sector.

However, the problem of introducing effective countermeasures are legion. Continuous changes of government make it difficult, if not impossible, to have any sustained program. Leaders everywhere tend to be most concerned with immediate issues, especially those affecting their tenure of power, whereas population programs take years to have any effect. Moreover population programs in Africa are vulnerable to the tides of religious fundamentalism now sweeping much of the world as well as to evidence of lagging interest on the part of the US and perhaps other donor countries.

Even today many doctors in Africa lack interest in family planning and are unwilling to work in rural areas. By far the largest percentage of government health money goes into urban curative services. Many potential users drop out because of real or imagined side effects and lack of medical facilities and advice as well as access to modern contraception.

But, above all, the problem comes down to an age-old desire of African parents, especially the husbands, to have many children - an average of six, including a strong preference for boys.

In the final analysis the most serious obstacle to coping with run-away population growth in Africa is the difficulty in persuading couples to limit family size to 2 or 3 when custom, tradition and perceived self-interest suggest they should have four or more.

This problem of motivation is not going to be solved by conventional IEC techniques any more than it will by the availability of the best in modern contraception, important and essential as these measures are.

What is involved is changing a whole continent's way of thinking. This will involve economic growth and modernization, advancing women's rights and female employment, vastly improved communications and travel, and above all education and job opportunities. Yet Africa's worsening economic and socio-political scene makes the achievement of these goals most difficult.

In any case, this is a time when we should be doing all possible to encourage and support Africa in its efforts to deal with excessive population growth.

Clearly, it is not the time to be cutting off funds to IPPF and to UNFPA, the latter being the principal donor and supporter of African population programs.

Mr. SCHEUER. Thank you very much, Ambassador Green.

Now Mr. Steve Isaacs of the Columbia University School for Population and Development——

Mr. ISAACS. Law and Policy Program.

Mr. SCHEUER. Right.

STATEMENT OF STEPHEN ISAACS, DIRECTOR, DEVELOPMENT LAW AND POLICY PROGRAM, CENTER FOR POPULATION AND FAMILY HEALTH, COLUMBIA UNIVERSITY

Mr. ISAACS. Thank you, Mr. Chairman. I appreciate the chance to testify on the current status and trends of population policy and programs in sub-Saharan Africa. I will try to just briefly summarize my remarks. In fact, this is kind of like the "Three Bears" testimony because you have a long statement, and then a shorter statement, and then this is the summary of that shorter statement, but basically I want to make three points to you.

First, there has been a marked change in the perceptions of at least a number of Africans—I'll use the word "Africans" for sub-Saharan Africans, just as a shorthand—a marked change in their perceptions toward population over the past 5 years, even.

Is this on?

Mr. SCHEUER. We have technicians coming.

Mr. ISAACS. Let me just use this one, I think.

I wanted to make three points to you: First, that over the past 5 years there has been a marked change in the perceptions of many African leaders towards population and population growth. Five years ago even the mention of the word "population" was taboo, and as recently as 1984, 40 leaders of African nations were willing to sign the "Kilimanjaro declaration" prior to the population meeting in Mexico City, which mentioned population as a key variable in development.

Second, that despite this growth and awareness there is little reason or ground for optimism about changes in fertility, at least over the short run. The conditions which tend to encourage large families exist and will continue to exist for a number of years.

The third point I would like to make to you is that this change of perception of African leadership is a rare opportunity for the United States and indeed for the international donor community.

With regard to the changes of perception of African leaders, there are a number of examples which should suffice to make this point. The latest development plans of 13 African countries mention specifically population and/or family planning and, of these, 11 express concern with these demographic issues. Government leaders are tending to speak out more and more openly and more forcefully on issues of population. It is common in the speeches of President Moi of Kenya or even of President Seyni Kountche of Niger.

Within the past 7 years, eight African countries have established population or family planning commissions or councils, and even this year two commissions were created. More African countries are writing or are starting to write explicit national population policies—that is, to address this issue directly—and at the moment Nigeria, Sierra Leone, and Liberia all have committees to draft national population policies. African parliamentarians, a hitherto neglected but nonetheless influential group, are becoming more forceful spokesmen. As Congressman Scheuer suggested, they are meeting next year in Harare, so one does see a marked change in attitude.

Nonetheless, on the action side progress has been slower. Of the 45 countries surveyed by the United Nations in 1983, 31 said that they supported family planning, albeit two-thirds of those did so indirectly through a private planning association, through provision of hospitals or clinics and so forth. A survey that was undertaken quite recently and printed in the World Bank's 1984 development report characterized all of the family planning programs of Africa as "weak" or "very weak," and I should say that it is still such a sensitive issue that it must be referred to and indeed justified as "birth spacing" rather than using the words "family planning" throughout most of Africa.

In francophobe countries contraception, the distribution and advertising of contraception, is still illegal. There are the remnants of a 1920 French law still on the books and, although that has been repealed in Senegal, the Ivory Coast, and the Cameroon, it exists and is on the books in most francophobe African countries.

Voluntary sterilization is not a part, generally speaking, of programs, and its status in the law is unclear. Again, in the French-speaking countries it may be illegal to perform a voluntary sterilization, even if the person consents to it.

Abortion laws generally are restrictive throughout the continent. Only Zambia and Liberia have reformed their laws to permit abortion where another child would cause severe economic or social hardship.

In terms of direct measures that governments can take, they are beginning to take some. I think it is remarkable even that the French countries, French-speaking countries, former French colonies, traditionally more restrictive, have repealed some of their more pro-natalist and restrictive legislation.

The high fertility I think is perfectly understandable when one looks at those conditions which generally are thought to affect the number of children families have. Infant mortality, as has been stated, is very high; 1 out of 10 African children will die before reaching the age of 1. Health care is very poor. The status of women is certainly very low. Dr. Fred Sai, a Ghanian physician now with the World Bank, commented that "the rural African woman is the most underprivileged of all human beings," and certainly traditionally in Africa women have value as bearers of children.

To these factors which tend to raise fertility, one should also add tribal conflicts, where additional numbers strengthen the tribe, the influence of Africa's two predominant religions, Catholicism and Islam, and several other factors.

What can one make of this situation where you have a recent government awareness of population problems but where you have traditional societies with low health, education, status of women, and other factors which tend to raise family size?

I would suggest several things: one, that this renewed interest of African leaders does present a rare opportunity for the United States and other donors which we should seize; second, and related to that, that we should support countries wishing to elaborate population policies, appoint national population commissions, or start strong family planning programs at the community level, as Kenya is now thinking of doing.

It is of some concern, for example, that just as Nigeria has recognized its population problem—the president, the chief of state of Nigeria, speaks out frequently on it, a commission is writing a population policy—just at that time there may be no additional funds for assistance to Nigeria. Over the long run I would think that improvements in health, and particularly the status of women, will be key to both development and reduced fertility, and I believe that the international agencies, particularly the World Bank, should play a larger role in African population than the development programs. Donor fatigue is easy. It can set in without the prospect of immediate success stories, but I think the opportunities really are there.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Isaacs follows:]

Statement of Stephen L. Isaacs, J.D.
Director, Development Law and Policy Program
Center for Population and Family Health
Columbia University
New York, NY

Mr. Chairman, I am Stephen Isaacs, Director of the Development Law and Policy Program of Columbia University's Center for Population and Family Health. I appreciate having the opportunity to testify before this subcommittee on the topic of the current status of and recent changes in population policies in sub-Saharan Africa.

INTRODUCTION

During the past five years, there has been a marked change in the perceptions of many African leaders.* towards population growth. Whereas the mere mention of the word "population" was considered taboo in most countries as recently as 1980, by 1984 representatives of 40 African countries were willing to sign the "Kilimanjaro declaration" of the African population conference held in Arusha, Tanzania. Among its other provisions, the Kilimanjaro Declaration set forth the principle that "population should be considered as a central issue in development strategies and plans."

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* For the sake of brevity, the word "Africa" is used herein to refer to Africa south of the Sahara, i.e., the 45 independent majority-ruled states south of Morocco, Tunisia, Libya, Algeria, and Egypt. The population of this region is estimated to be approximately 400 million, of which one-fifth live in Nigeria.

Although the changes of attitudes of government leaders are encouraging, there is little ground for optimism about the prospects for significant changes in patterns of population growth, at least over the short term. Population growth rates in Africa remains much the highest of any region in the world, and the conditions that tend to foster high fertility continue to exist. There is not a single family planning program in Africa-that could be considered a strong one. Were one to be implemented, it is not known whether sufficient demand for small families exists to make it successful.

FRAMEWORK FOR ANALYZING POPULATION POLICIES AND PROGRAMS IN AFRICA

Couples have fewer children when (1) they perceive smaller family size to be in their best interest, i.e., there is a demand, and (2) they have the means to satisfy that demand, i.e., the supply side is taken care of. Governments--and the private sector--can take a number of actions to help lower fertility, the most direct of which relate to the supply side.

Among the direct fertility-related measures are:

- o Issue formal "population polices", in the form of legislation, decrees, statements of government leaders, provisions in development plans, articles in constitutions, etc.

- Provide family planning services--through clinics, through community-based programs, and through social marketing networks.
- Offer sterilization services.
- Offer abortion services.
- Provide incentives and disincentives for small families.
- Encourage breastfeeding.
- Encourage later marriage.

To increase demand, governments can encourage those conditions which, worldwide, have been associated with lowered fertility.

- Improve status of women.
- Increase educational opportunity.
- Improve health, particularly to reduce infant mortality.
- Increase income.*

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* This is not a comprehensive list of actions that can be taken, but has been tailored to include those that appear most relevant to Africa.

CONDITIONS AND POLICIES INDIRECTLY INFLUENCING POPULATION GROWTH RATES

Using this as a framework, let us turn first to the "demand" side, examining the African setting and the policies that tend to affect population growth indirectly.

- Fertility and Mortality. Demographically, Africa is growing at 3.1% a year, a rate five times as fast as that of the population the United States and twice as high as Europe at the peak of its demographic explosion. If this were to continue, the population would double in 22 years. The average African woman bears 6.6 children, with West Africa women bearing 6.9 children over their lifetime. Evidence from recent fertility and contraceptive prevalence studies indicates that in many countries African women want even more children than they are having. In Kenya, fertility has been rising. In that country, the average woman had 6.2 children in 1960, 7.2 in 1970, and 8.1 in 1982.*

Mortality is the highest of any region in the world. Infant mortality rates average more than 100 per 1,000 live births; in other words, throughout most of Africa, one out of 10 children will die before reaching the age of one. In comparison, in the United States one of 100 children will die before reaching the age of one. Maternal mortality is also very high. In Ghana, 400 women die per 100,000 live births; in Senegal the number is 700. By comparison, maternal mortality in the United States is about 15 per 100,000 live births. As Dr. Fred Sai has commented, "The high population growth rates of Africa result from high fertility and relatively high mortality and are achieved at a very high price in the lives and health of Afican women."(1)

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* Paradoxically, infertility, believed to be caused by high prevalence of sexually transmitted diseases, is a health problem in a number of central African countries.

o *Health Care*. As David Lamb wrote in his recent book *The Africans*, "There is nothing more responsible for shaping the character of Africa than health, or more appropriately, the lack of good health. It is the major obstacle retarding Africa's growth and development, the impartial equalizer that enforces the Africans' casual, fatalistic approach towards life."[2] The lack of good health care is reflected in the mortality rates cited above, but also in high morbidity from infectious and communicable diseases, many of which are preventable or treatable with medicines and technology now available. Europe has one physician for every 580 persons; Kenya has one for every 25,000 persons; Burkina Faso, one for every 92,000. Although it may appear inappropriate, much of the health care budget still goes towards hospitals in the big cities and doctors practicing highly-technical specialities.

o *Nutrition and Agriculture*. Contributing to the poor state of the Africans' health is pervasive malnutrition. It acts synergistically with respiratory and intestinal diseases to sap the strength of the population and contribute to high mortality rates. Of course, the effect of the drought has, deservedly, received great attention, but the problem throughout Africa is more severe and pervasive. In 1970, Africa was nearly self-sufficient in food production; today, every country (but South Africa) imports food and one-fifth of the grain Africans eat is imported. As one newspaper noted, "Africa is the only region of the world where food production is losing the race with population."[3] Deforestation is increasing; the Sahara encroaches at a rate of 250,000 acres a year, and there is danger that the delicate layer of topsoil is being eroded away.

o Education. Population growth rates have been closely correlated with education, particularly female education. Almost all African countries have policies mandating education through the primary grades, and African governments have made strong commitments to education since independence. Indeed, considerable progress has been made. Yet in the majority of countries, the literacy rate is less than 30%, and the number of school-age children not in school in very high (around 29 million).

o Status of Women. "Perhaps the rural African woman is the most underprivileged of all human beings," noted one acute observer of Africa. "Various social roles, cultural practices, and the biological tasks imposed by fertility, have combined to keep the average rural African woman close to a beast of burden."[4] Although African women may be the backbone of the rural economic community and the hub around which the spokes of society turn, they remain second-class citizens. In many countries a married woman inherits nothing from her father, can be divorced unilaterally by her husband, and is expected to be faithful while her spouse has as many wives and girlfriends as he can support.

Women have value in the eyes of their society only as bearers of children. Thus, it is common for women to start bearing children as soon as they are biologically able and to continue until reaching menopause. The status of women has been a matter of concern to some African nations. For example, within the past decade five countries have amended their constitutions to provide equality between men and women, and others have passed legislation to improve the status of women.

Thus, when one examines those factors traditionally considered as creating a desire in people to have fewer children--namely, lower infant mortality, higher levels of education, and improvements in the role and status of women, it is not surprising that fertility in Africa has remained very high. If one considers other factors often related to childbearing, the picture remains the same. Per capita income remains low, averaging $365, and the economies of all but a handful of countries are stagnating or deteriorating. Although a few cities such as Lagos or Nairobi have expanded up to or beyond the breaking point, most of Africa is rural and dependent upon subsistence agriculture where aditional children provide extra hands and a form of old age insurance. To these must be added other forces tending to promote large family size: a tribal loyalties and rivalries where more children are viewed as increasing the power of the tribe; the influence of Africa's two largest religions, Catholicism and Islam, both of which are pronatalist, and the legacy of colonialism, which sapped the self-esteem of many Africans, a self-worth that may be regained by having many children.

DIRECT MEASURES AFFECTING POPULATION GROWTH RATES. In analyzing the direct measures that states can utilize, the francophone countries should be distinguished from the anglophone. The French-speaking countries have been more pronatalist and have adopted far more restrictive legislation than their English-speaking counterparts. This is beginning to change as governments of the francophone African countries of the Sahel, affected by drought and poverty, begin to be aware that large families can be a burden as well as a blessing.

o Population Policies and Statements of Government Support. Given the political sensitivity of population, it is remarkable that so many leaders have spoken out in favor of reducing population growth and that many governments have issued policies. Some evidence of this change in perceptions can be seen from the following:

> Of 42 African countries surveyed by the United Nations in 1983, 17 considered their population growth rates to be a constraint to development. Eight countries, which had been satisfied with their population growth rates two years earlier, were now concerned about them.
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> The development plans of 13 African countries--Botswana, Cameroon, Gambia, Ghana, Kenya, Lesotho, Mauritius, Nigeria, Rwanda, Senegal, Swaziland, Uganda, and Zambia--discuss population or family planning. Of these, 11 express concern that high rates of population growth impede development and propose measures to reduce them. Some, such as the Five-Year Development Plan of Rwanda, set specific targets.
>
> Government leaders are speaking more openly and forcefully on the topic. It is a common theme in the speeches of President Moi of Kenya and was frequently mentioned by General Buhari, former chief-of-state of Nigeria. At a conference on health and development, Niger's president Kountche put in an unexpected appearance and said, in the most forceful terms, that

rapid population growth was threatening the country's well-being and a population policy was absolutely necessary. At the Arusha Population Conference in 1984, the government of Mali announced that it could no longer be reticent about the problems caused by population growth and would now confront these problems directly through sectoral plans and demographic policies.

African parliamentarians are beginning to play a more active role in population and development. National meetings of parliamentarians have been held in Tanzania and Kenya, and one is scheduled for the Ivory Coast. A pan-African conference of parliamentarians interested in population and development is planned for May, 1986.

Leaders of African governments are willing to sign international declarations and statements containing comparatively strong language on population. This includes the Kilimanjaro Declaration mentioned earlier and the revised Plan of Action of the International Conference on Population held in Mexico in 1984. Most recently a "Statement on Population Stabilization by World Leaders," asserting that the time has come to slow down the growth of human numbers, was signed by the heads of state of Kenya, Zimbabwe, Rwanda, Guinea-Bissau, Mauritius, Nigeria, and the Seychelles.

A number of countries have established national population commissions or national family planning councils. Some countries have written, or are in the process of writing, explicit population policies. Within the past seven years national population councils have been established in Cameroon, Kenya, Liberia, Nigeria, Rwanda, Senegal, Sierra Leone, and Zimbabwe. Officials in Liberia, Sierra Leone,and Nigeria are now in the process of drafting official population policies for their governments.*

It should be noted that a serious factor inhibiting the issuance of population policies is a lack of reliable demographic data, a point made over and over by participants at the Population Conference in Arusha. As just one example, we do not know the population of Nigeria since the last two censuses were never published.

Two key points to keep in mind in considering population policy in Africa.. First, the rapidity of the change in attitude from an almost universal pronatalism to a greatly increased recognition--and articulation--of the problems of population growth. Second, changes have taken place in francophone countries, with their more restrictive traditions, as well as the anglophone countries. That the francophone countries of Senegal, Burundi, Rwanda, Niger, and Mali have all expressed concern about their demographic situations is quite remarkable.

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* Governments already having explicit population policy documents, excluding that found in development plans, are Gambia, Kenya, Ghana (and Burundi, if one counts the strong statement of the ruling party issued in 1983).

o Family Planning. Family planning programs are less extensive in Africa than in other regions. Thirty-one of 45 governments surveyed by the United Nations in 1983 reported that they supported family planning in some measure. Two-fifths supported services only indirectly, i.e., by grants or provision of facilities to private family planning associations. Eleven countries--mostly in francophone Africa--reported that they provided no support for family planning services. With the exception of Mauritius, contraceptive usage in Africa is negligible.

It should be mentioned that although atitudes are changing, "family planning" remains so sensitive in Africa that it must be referred to, and justified as, "birth spacing." Birth spacing (largely through postpartum abstinence and breastfeeding) is traditional in rural African societies, and the shortening of the intervals between births is one of the causes of expanding population growth.

It also bears mentioning that family planning programs in Africa are weak. A recent study found that all of the programs examined in Africa were either "weak"or "very weak."5 Thus, it is not fair to say, as I have heard it said, that "family planning has failed in, say, Kenya." All that one can correctly say is that weak family planning programs have not succeeded.

With few exceptions, African family planning programs--indeed African health care--are based on the western model of doctors providing services through clinics. This might work fine in the United States, but in Africa, where there are so few physicians (most located in the capital) and where transportation is so difficult, it deprives individuals of services. Unlike Asia and Latin America where such programs have mushroomed, community-based and social marketing programs are almost non-existent.

o Legislation on Contraception. In most francophone countries, it is still illegal, under laws based on a provision in the 1920 French Code, to advertise or distribute contraceptives. Although these laws are not strictly enforced, they can serve as an obstacle to the provision of information and services. Recently, Senegal, Ivory Coast, and Cameroon repealed their anti-contraceptive laws; Niger and Burkina Faso are considering similar repeal.

o Voluntary Sterilization. The prevalence of voluntary sterilization is negligible (less than one percent in all African countries surveyed recently); it does not form a major part of the family planning programs in Africa. It is, however, an appropriate method for people who do not want any more children, and interest is growing sufficiently for the Association for Voluntary Sterillization to consider setting up offices in some African countries. A recent conference on Reproductive Health in sub-Saharan Africa --the first of its kind--recommended that this method be made available, although there was heated debate about whether it should be available to all individuals or only to older women of high parity. The legal status of voluntary sterilization is somewhat cloudy, particularly in francophone countries where it may be a crime to perform a sterilization for family planning purposes, even though the person has given consent.

o Abortion. Several studies have appeared documenting the existence of widespread illegal abortion--which is becoming a serious health concern in several of the bigger African cities. Throughout Africa, the abortion laws are restrictive. Only Zambia and Liberia have enacted legislation that permits abortion to save the life or preserve the health of the woman or where another child would cause social or economic distress. Most African countries have, simply, adopted the laws of their previous colonizers. Thus, in those countries once ruled by

France or Belgium, abortion is illegal (though in practical terms an exception is made where abortion is necessary to save the woman's life). Those countries colonized by Britain follow the rule laid down by the 1935 Bourne case which, in simplest terms, permits abortion where it is performed in good faith by a physician to preserve the life or the health (either physical or mental) or the woman.

o Incentives. Economic incentives to promote, or "disincentives" to discourage, childbearing have been used very little in AFrica. Under its 1969 population policy, Ghanaian civil servants are entitled to maternity leave and and family allowances for their first three children only. Tanzania grants a woman maternity leave only every three years, while Kenya allows tax deductions for up to four children.

o Age at Marriage and Breastfeeding. As mentioned above, the age at marriage throughout Africa remains quite young, and women have their first child at an early age. A number of countries have considered legislating a higher marriage age, although this (like changes in laws affecting polygamy) can come into conflict with entrenched cultural mores and religious attitudes. Breastfeeding is still widely practiced in rural Africa, although the practice appears to be diminishing somewhat in the large cities.

o CONCLUSION. What can one conclude from this picture of generally traditional societies with low levels of health, education, contraceptive prevalence, income status of women, and other socioeconomic measures of well-being--yet with a new-found interest among the leadership in population matters that was inconceivable a decade ago, or less? What is the proper response of the United States?

- The interest in population demonstrated by African leaders is a rare opportunity that the United States should sieze.
- Support should be given to countries wishing to elaborate population policies, appoint national population commissions, and implement family planning programs. It is of some concern that funds may not be available to help Nigeria, just at the time the government seems serious about tackling its population problems.
- With regard to family planning, encouragement should be given to countries making serious efforts to improve family planning information and services. This means supporting a wide range of services (as, for example, Kenya is considering) by community agents and greater use of the private sector and provision of voluntary sterilization programs.

- Over the long run, improved education, status of women, and health care will be crucial in Africa. Health can be improved immediately with technology available today; primary health care programs in and by the community are a key. Great attention should be given to educating and creating employment opportunities for women, perhaps the single most critical factor in reducing both fertility and infant mortality.

- International agencies, particularly the World Bank, should be prepared to play a more active role in population (and other development) activities in Africa than they have in the past. "Donor Fatigue" and discouragement can easily set in, particularly with no immediate prospects for success stories. Patience will be needed. As one analyst observed:

> The choices are simple. The Western world can make no new effort to avert Africa's impending explosion, or it can organize the desperately needed, highly expensive commitment required to stop the deterioration of resources--water, wood, grain--essential to support life. Although the world may do nothing now, it will be harder to stick to the course of inaction as the crisis intensifies.[6]

FOOTNOTES

1. Fred Sai, "The Population Factor in Africa's Development Dilemma," Science 226:801-5 (1984)
2. David Lamb, The Africans (Vintage, 1985), p. 260
3. Wall Street Journal, July 15, 1985, p. 1
4. Fred Sai, op. cit.
5. R.J. Lapham and W.P. Mauldin, "Family Planning Program Effort and Birthrate Decline in Developing Countries," Int'l. Fam. Plan. Perspectives, 10: 109-118 (1984)
6. Wall Street Journal, August 9, 1985, p. 21

Mr. Scheuer. Thank you very much, Mr. Isaacs.

I should say for the record that you, as director of the Development Law and Policy Program of the Center for Population and Family health, have been an adviser to countries in Africa and around the world on how to change their laws and their administrative rules and regulations to permit enlightened population policies and programs of all kinds. You have been a real engine of change in that direction.

Mr. Isaacs. Thank you very much.

Mr. Scheuer. All right. Our last witness will be Werner Fornos, president of the Population Institute.

Mr. Fornos. Thank you, Mr. Chairman.

Mr. Scheuer. If you will try and sum up in about 7 or 8 minutes, then we will have a chance to ask the panel some questions.

Mr. Fornos. You know me. That's very difficult to do in that time.

Mr. Scheuer. Yes; it is for all of you. I know all of you.

STATEMENT OF WERNER FORNOS, PRESIDENT, THE POPULATION INSTITUTE

Mr. Fornos. I do want to say at the beginning, however, that I want to congratulate your committee for the leadership that it has shown in tackling this very sensitive and political question. If I had any wish that I could give to this entire Congress, I wish that we could take the other Members, such as Congresswoman Schneider and yourself have done, to the areas of the world which are suffering the most as a result of overpopulation, shortened resources, and environmental degradation. Once the Members of Congress have seen those conditions, they become believers in this humanitarian effort.

U.S. policy on international population assistance is becoming an arena of contradiction and of controversy, and some unfortunate policy decisions are being made. The administration has determined that, in and of itself, population growth is a neutral phenomenon—that it is neither good or bad—but one can only arrive at this conclusion by ignoring the realities of our world.

Lester Thurow, an economist at the Massachusetts Institute of Technology, points out the folly of this theory which asserts that more people represent more resources, and that the Earth's real capacity has hardly been developed. He recently characterized the neutral phenomenon theory by stating that if the entire world had the productivity of Sweden, the consumption of China, and the social compatibility of the Dutch, that then you would realize that we really don't have a population problem. Conversely, he said that if you were to take a look at this problem from another standpoint and look at the productivity of Haiti and the consumption rate of us Americans and the social compatibility of a Uganda, then you would come to the conclusion that the world in many parts is already vastly overpopulated.

From a realistic standpoint, population growth is not a neutral phenomenon. It is the factor which allows societies to prosper or which forces societies and individuals into poverty and suffering due to overburdened economic and natural resources. From my experience in Third World nations, I can tell you that the results of rampant population growth are tragic, but even more tragic is the fact that massive human suffering such as we are seeing in Africa today could largely be prevented.

The African situation is almost a textbook—a textbook case of what happens when population is allowed to grow limitlessly. In the 1960's and the 1970's Africa's leaders could not be convinced that there was a need for family planning programs. You will recall when we were in Bucharest in 1974 at the first official governmental conference on population, many of the African nations asserted that the best contraceptive available was development assistance and that once the African nations, the newly emerging African nations, could develop economically, that that then would be the solution to the population problem.

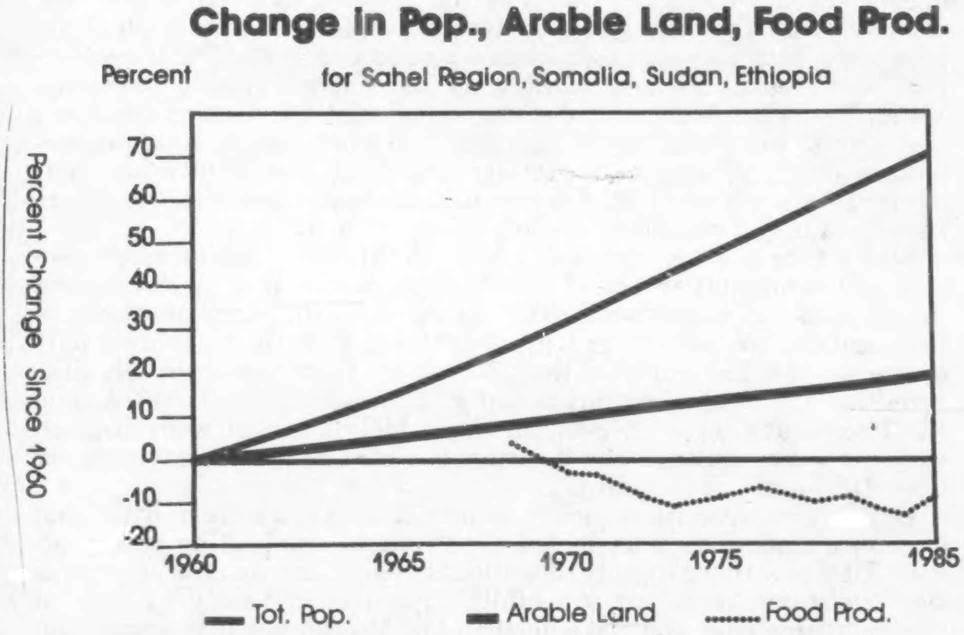
Yet as population grew unbridled and the problems associated with high fertility became all too apparent, Africa has now received the dubious distinction of being the fastest growing continent, and with that distinction of being the fastest growing continent come some rather startling realizations: Twenty-five percent of the world's poorest countries are in Africa. Life expectancy is roughly 50 years of age. The average African mother, who starts childbearing well before age 20, has six to eight children. Approximately 40 percent of these children die before reaching the age of 5. Fifty percent of African women who reach age 15 die before they complete their childbearing years, and the decline in available food per capita is causing half of Africa's population to face severe food shortages.

For the sake of clarity—I have been told in my earlier journalism training that a picture is worth 1,000 words—I think a chart also can give us that same realization. We charted for you as an example population growth rates for the Sahel region, including Somalia, Sudan, and Ethiopia. If you have followed the population increase, the increase of arable lands and the increase in food production, you don't have to be a Ph.D. to understand the collision course which Africa finds itself on.

With your permission, we would like to include that chart in the record of the hearing.

Mr. **Scheuer**. So ordered.

[Material to be supplied follows:]



Mr. FORNOS. Only one in four Africans has access—yes, sir?

Mr. SCHEUER. Is that jagged line on the bottom——

Mr. FORNOS. Food production.

Mr. SCHEUER [continuing]. Per capita food production?

Mr. FORNOS. Yes.

The rhetoric of the statistics pales in comparison to the actual facts, but only one in four Africans has access to clean water and medical services, and the average per capita expenditure for health services in 1983, the last available year for these statistics, is $8—$8 for health care per year, and many of the countries in Africa, as many as seven, at least, have only $1 per capita health expenditures, so these health figures put into a juxtaposition for us what kind of priorities African nations have, especially when you realize that the expenditure per soldier is $9,871.

There are other terrifying scenarios in the sub-Sahara regarding overpopulation. We talked earlier—Ambassador Green mentioned to you Nigeria, which today has a population of 90 million. Let me just bring that to a higher point, from the standpoint that with an annual growth rate of 3.2 percent—and Michael mentioned earlier that we can't really be sure, it may even be higher than 3.2 percent—if the current trend continues, Nigeria will in 76 years be larger than the People's Republic of China. Kenya, given current growth rates, will by the year 2065 be twice the size of the United States population today.

Now this cannot happen. It will not happen. Nature will intervene, and when nature does, it is never very kind. It is possible to save Africa but it is going to take a major plan of concerted action by all countries within the region. The good news is that many African nations, as has been pointed out by my colleague Steve Isaacs, are now reaching the conclusion that in order to provide a decent standard of living for their people and to avert major civil disorder, that they are going to have to implement family planning programs. Fifteen years ago when I was at the first African population conference, no one wanted to talk about family planning. When I was in Arusha in January 1984 and the chairman of the committee, the Planning Minister of Tanzania, asked the delegates who wanted to speak on family planning, we remember how amazed we were when 30 African nations held their banners up, so there is a major change occurring.

While this is true, and while now 13 African nations have policies and some 40 percent of the African people live under governments who see excessive fertility rates as a hindrance to their determination, we see in the United States a shift in policy. Not only do we see the defunding of the $17 million that was originally allocated for IPPF, the current cutoff of $10 million for UNFPA, and the President's letter to Senator Jesse Helms of last week indicating that he concurs in the decision of Peter McPherson, threatens even 1986 and 1987 funding.

But at the same time we are seeing that there is very little that this administration puts in the forefront of combatting this problem. This is a turnaround from the 20 years that we saw of population assistance, a bipartisan effort supported not only by you for the long time that you have been in the House, but it is ironic that the original cosponsors of the International Population Assistance law included George Bush, who then was a Member of the House.

We have to really—when I mentioned at the beginning that we need a new political courage, and I'm delighted to see that you have a copy of that "Dear Jesse" memo from the President in front of you—it's a chilling effect, these kind of memorandums, a chilling effect upon providing family planning services to the most desperate and the most poor in the world, especially when you see first IPPF, then UNFPA, now the decision on natural family planning, to go ahead to and have a policy which says that we will spend large, scarce amounts of taxpayers' dollars on methods which are not only ineffective for the most part—unless you happen to be a sexually abstinent couple over 40—but methods that defy the domination we heard spoken of, male dominance over women, and saying to the family, "You must stay abstinent for 2 weeks," defy the respect and decency that medical ethics have of providing full information and legitimate information about all medically approved methods, which has been the policy of the United States until just recently.

While these things are happening, we know that in the next instance there will be another shoe to drop and the secret plan to dismantle international population assistance, which you yourself stated in 1980, is not so secret any more, and all of the things that you spoke of to the parliamentarians that gathered here post-Sri Lanka conference are happening and they are very real. They are representing a reprehensible retreat from reality, and it will only be the leadership of the Congress which will again restore U.S. commitment to this humanitarian assistance, not only for IPPF, UNFPA, but most importantly to the people of the world so that they can make an informed choice on how to limit their family size, how to space their children. When we do this, we can see a better quality of life for not only the people of Africa but for all of the people in the world.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Fornos follows:]

Statement by Werner Fornos
President of the Population Institute
before the Subcommittee on Natural Resources, Agriculture
Research and Environment of the U.S. House of Representatives
Committee on Science and Technology

Mr. Chairman, I appreciate the opportunity to participate in this series of hearings focusing on the grave ecological problems of the African continent. I am Werner Fornos, President of the Population Institute, the largest citizens' network seeking to bring world population into balance with global resources. The Population Institute is a private, nonprofit organization.

U.S. policy on international population assistance is becoming an arena of contradiction and controversy and some unfortunate policy decisions are being made. The Reagan Administration has determined that in and of itself, population growth is a neutral phenomenon, that it is neither good or bad. But one can only arrive at this conclusion by ignoring the realities of our world.

Lester Thurow, an economist at the Massachusetts Institute of Technology points out the folly of the theory that more people represent more resources and that the earth's real capacity has hardly been developed. He recently characterized the "neutral phenomenon" theory by stating, "if the entire world had the productivity of the Swedes ($10,241 per person per year), the consumption standards of the Chinese (less than $200 per person per year), and the social discipline of the Dutch when it comes to peacefully living side by side, the world could carry many times its present population. Conversely, if you assume that the world has the productivity of Haiti, the consumption standards of the Americans, and the social discipline of Uganda, the world is grossly overpopulated."

From a realistic standpoint, population growth is not a neutral phenomenon. It is the factor which allows societies to prosper or which forces societies and individuals into poverty and suffering due to overburdened economic and natural resources. From my experiences in Third World nations, I can tell you that the results of rampant population growth are tragic. But even more tragic is the fact that massive human suffering - such as Africa faces today - could largely be prevented.

The African situation is almost a textbook case of what happens when population is allowed to grow limitlessly. In the 1960s and '70s, African leaders could not be convinced that there was a need for family planning programs. They did not see the demographic pressure building and the newly emerging nations were suspicious of what they perceived as an imperialist conspiracy concocted by industrial nations aimed at limiting their numbers.

As population grew unbridled, the problems associated with high fertility became all too apparent. Africa now has the dubious distinction of being the fastest growing region of the world and this has led to some very grim statistics:

-- 25 of the world's poorest countries are in Africa;

-- life expectancy is roughly 50 years of age;

-- the average African mother, who starts childbearing well before age 20, has 6 to 8 children. Approximately 40 per cent of these children die before reaching age 5;

-- Fifty per cent of African women who reach 15 die before the end of their childbearing period;

-- a decline in available food per capita is causing half of Africa's population to face severe food shortages;

-- only one in four Africans has access to clean water and medical services and the average per capita expenditure for health in Africa is $8 per year, and is as low as $1 in some countries.

There are other terrifying scenarios in the Sub-Sahara regarding overpopulation. Consider Nigeria with a population of 90 million and an annual growth rate of 3.2 per cent. If current trends continue, Nigeria will have a population the size of today's China (1.1 billion) in just over 75 years. Kenya, with a population of 20 million and a growth rate of 4 percent will reach the size of China in 100 years if present trends continue.

It is possible to save Africa but it is going to take a major plan of concerted action by all countries within the region. The good news is that many African nations are now reaching the conclusion that in order to provide a decent standard of living for their people and to avert major civil disorder they are going to have to implement family planning programs.

Fifteen years ago when the first African Population Conference was held, no one wanted to talk about family planning. But the response was different when I attended the second African Population Conference in 1984. Representatives of 30 African nations took the floor to speak of the necessity of slowing population growth and of the availability of contraceptive information, education and services.

While it is true that only 9 African nations have a population policy at this point, attitudes are changing. About 40 percent of the Sub-Saharan countries now have family planning programs. Most African countries are still limited by economic constraints, so it will require considerable assistance from the industrialized world to make Africa's aspirations for a better quality of life a reality.

For these reasons it is imperatiave that the U.S. and other industrialized nations do their utmost to increase population assistance for the nations of Africa and elsewhere in the developing world.

Unfortunately, just at a time when population programs should be accelerated, current U.S. policy amounts to a giant leap backward.

Last year the U.S. cut off $17 million in funding for the International Planned Parenthood Federation, the largest private organization providing family planning assistance to the developing world. This year the U.S. has cut off $10 million of a grant mandated by Congress to the United Nations Fund for Population Activities, the largest multilateral provider of family planning assistance to the developing world.

We are also seeing rational, ethical population policies sacrificed for the sake of political expediency. The Administration is now advocating abstinence and rhythm as legitimate birth control measures to appease the religious right.

There is little doubt that what we are witnessing today is a concerted effort by anti-family planning forces to stop all U.S. population assistance abroad. First, IPPF, then UNFPA --- and who knows what the next target will be? But we can be assured there will be a next target. We are all opposed to coercion. But isn't it just as coercive to deny an illiterate woman already living below the poverty level the information she needs to make an informed judgement about so crucial a decision as the number of children she will bear? The denial of facts effecting her health (which could lead to death in countries of high maternal mortality) is a cruel violation of medical ethics and above all the woman's human rights.

Ninety two percent of the population increase between now and the end of the decade will be in the poorest nations of the world -- including the nations of Africa. If these countries are to achieve a better quality of life, their people must have the basic human right to determine the size and spacing of their families. In order to exercise that right, there must be assistance from the United States and the industrialized world. For two decades, this country has been encouraging the nations of Africa and the Third World to come to grips with their population problems; for us to turn our back at this time is a reprehensible retreat from reality.

As concerned and responsible Members of Congress, you must counteract this trend. Government commitment is one of the most important elements of a national family planning programs. Most governments around the world have recognized the need for a coherent family planning program and have requested assistance. This is the best opportunity the United States has had to assist other nations in their effort to control population growth. We must continue to provide them with information, technology and services. We will lose this opportunity if we approach other nations with unclear policies and a lack of commitment.

U.S. population programs overseas can only get on track again if Congress takes a courageous stand and refuses to buckle to the pressure of a vocal minority that would deny poor women of the developing world the right that evey American woman has: the right to make her own decisions with regard to her own fertility.

Mr. **Scheuer**. Well, thank you very much, Werner Fornos. Thanks to all of the members of the panel for their predictably excellent, forthright, and hard-hitting testimony.

We are going to have to stick to the 5-minute rule now for Members up here because we have another very excellent panel awaiting us. Congresswoman Claudine Schneider.

Miss **Schneider**. The first question I would like to raise—I don't think my microphone is working either but I assume you can hear me—I would like to address this question to Mr. Isaacs. You had mentioned that the World Bank should play a greater role. I would like you to give me some specifics as to what the World Bank might do in terms of taking some actions to improve the population problems Africa is facing.

Mr. **Isaacs**. Yes. The World Bank of course tends to loan money at commercial interest rates, which is—and because of that the tendency, both by the bank itself and by the recipients, has been to put that money into large kinds of projects where you get a seeable return over numbers of years—dams, big hospitals, and so forth. I think that there are a number of other kinds of projects where the bank could use its money and, I would suggest, at lower interest rates through the "soft loan window" as they say.

But in terms of human training, of building, for example, smaller facilities in a number of places, in terms of programs, I think that the focus of the bank on large projects, on the kinds of big buck projects, is not well directed. I think the problem is a twofold one because I think the developing countries as well are often reluctant to take money on loan terms, where they have to pay significant interest rates for these sorts of resource development which may in the long run be very helpful to them.

Miss SCHNEIDER. So, to summarize your answer, you would say that the best thing that the World Bank could do to alleviate some of the pressure and problems is to focus on smaller projects?

Mr. ISAACS. I would suggest focusing on a number of the smaller projects, and I would think that were they able to offer assistance on such—not—with lower interest rates, I think that certainly would be very helpful, yes.

Miss SCHNEIDER. I would like to follow that up with a question focusing on the availability of AID funds for such programs. Might I assume that the limited financial resources that are available now for population concerns are being targeted to those countries that need that money the most and can most effectively use them, or is the money going everywhere, or what to your knowledge is the process for distribution of these moneys?

Mr. ISAACS. To my knowledge more is being done in Africa than had been done before, and certainly within the Population Office that has been targeted, but the problem—let me give you a—recount something that happened the other day.

Miss SCHNEIDER. OK, but I only have 5 minutes to ask questions.

Mr. ISAACS. Oh, you have 5 minutes? OK. I'm sorry. I will be very brief with this.

Miss SCHNEIDER. OK.

Mr. ISAACS. It was a meeting of the World Bank, AID, the UNFPA, about Nigeria. The UNFPA felt that they had no money for Nigeria because of the potential cutoff. The AID person questioned whether more money would be able to be given to Nigeria. It left the Nigerians, then, with the position of taking high-interest loans or no additional help at a time they needed it.

Miss SCHNEIDER. OK. Mr. Fornos, I wonder if you could elaborate a little further on what recommendations you might have for AID's population account? They have a total of about $290 million in 1985. In 1986 the appropriation process is not completed but the House is recommending $261 million and the Senate hasn't even met yet, as far as I know. How much would you suggest ought to be used, for example, for research—since this is the Science and Technology Committee—not only how much for research but what kind, why?

Mr. FORNOS. First of all, it depends on—I'm not so sure we really should be appropriating any money for population until the administration straightens out the population program. If it is willing to abandon UNFPA, then I'm not so sure what is left. They have abandoned IPPF, and it puts in the serious question whether we should or whether we are acting fiscally responsibly in making even the $261 million available, but I would hope that saner minds would prevail and that in the passage of the continuing resolution we can add necessary language to make the administration live up to the Congress' mandated population programs.

If by research money you intend to continue spending money on the study of polygamy and its effect on lowering fertility in Africa, I don't know where this will lead us. Is the President going to recommend polygamy as a good means of limiting family size? I think that research needs to be done on safer contraceptives, on contraceptives that have a greater effect with less impact upon users, yes, but I think that with the World Fertility Survey saying to us that some 400 million people in the world—at the London meeting that you and I attended—neither want any more children and want to limit their family size, and lack the education and the means to do so, I think our largest investment ought to be in family planning programs that work.

Miss SCHNEIDER. Did the bell ring for me?

Mr. SCHEUER. It did.

Miss SCHNEIDER. It did? I thought I was just hearing things.

Mr. SCHEUER. Ask not for whom the bell tolls; it tolls for you.

Miss SCHNEIDER. Thank you, Mr. Chairman.

Mr. SCHEUER. Congresswoman Jan Meyers of Kansas.

Mrs. MEYERS. I think I will address this question to Mr. Fornos, but anyone can respond to it that would like to. I think there were a number of Members of Congress who voted this year to cut funding for UNFPA or to restrict it because of concern about population control measures in China. Now I realize we're talking about Africa today but I think in terms of attitudes of Congressmen we somehow have to get that picture straightened out. Is the picture that was presented to Congress accurate? Are there coercive abortions? What can we do to make sure that we are not participating in that, so that we can again maybe get more support within Congress for population planning?

I do think that the support is there. The pressures that you mentioned are always there, and they are there in my district, against any kind of family planning measures—against title 10, against anything. It isn't just abortion. But I would say 80 percent to 85 percent of my district understands what the concerns are and is supportive. We just have to do a better education job, and this concern about China has made it more difficult, so will you speak to me about that, and then anybody else who would like to?

Mr. FORNOS. I think in any hearing of this type, in any dialog that you and I have on this issue, Mrs. Meyers, we have to first of all say that I don't think there is anybody in the family planning movement today that supports coercion or force in any fashion. The dialog over China has now taken over a year in the Congress of the United States, and has of course been magnified by the NOVA report by BBC which the Chinese claim never took place. The Chinese claim that a health television program was produced and they asked to see maternal/child care, and therefore were given a very much pregnant woman that was being talked to by a health assistant, and that was then turned into a claim that this woman was being coerced into abortion in the ninth month of her pregnancy.

I don't intend to be an apologist for China. I don't think anybody can be. They certainly speak very well for themselves, but what is amazing to me is that the same Chinese leaders from the President on down that have given the United States assurance that the Government of China opposes force and coercion of any kind in its family planning program, those same leaders whose word we are not willing to accept on this issue—relying instead on isolated reports, many of them exaggerated, many of them from hearsay evidence, and many of them just patently unbelievable, relying instead on those reports—yet on the most sensitive issue facing the United States, that of nuclear technology, we are willing to accept those same leaders' guarantees, without any treaty or anything, that they will not take the $6 billion in nuclear technology that we are going to provide them and use it to make bombs.

When I said earlier it is a reprehensible policy we are facing, I think the administration finds itself between a rock and a hard spot. No. 1, they lack the evidence of any support for forced or coerced abortion by the Government of China, yet on the other hand the public outcry against these kinds of human rights violations, no matter where they occur, makes us want to do something to prove that we are in every instance opposed to force and coercion. I don't know how we are going to get out of that, except from the fact that I know from three visits to China, that I have talked with numbers of people—and Marshall Green has written an excellent piece just recently on his recent visit to China—that the Government is moving vigorously to wipe out any vestiges of coercion or force.

An interesting thing, and I think it relates to how we communicate with our people back home, Minister Huang Hue to me, "I have been to your country and every day in the newspaper I see incidents of rape. Is it not against the law in the United States that you cannot rape a woman?" And he says, "Are we to assume, because you cannot wipe out rape, that the Government condones or supports or even encourages rape?" Well, obviously the answer is no, and it is in this kind of a context of education that the Chinese find it very hard to understand why we would involve ourselves in the sovereign affairs of China, despite the fact that they have given us international evidence that they are opposed to force and coercion.

Miss SCHNEIDER. Could I ask Mr. Green if he could comment on that, too?

Mr. SCHEUER. Surely.

Ambassador GREEN. I fully agree with what Werner Fornos has just said. I think it's clear that this is against the law in China. They have made it clear under their constitution, their marriage laws and, what is more, many stories have been picked up by people who are trying to give a bad name to China for various reasons and a lot of these stories have come right out of the Chinese press. The Chinese Government is making no secret of these cases of coercion, wherever they occur, in order to tell people that this is illegal. They are trying to make it clear to the people that the Government will not countenance these things, that these are regarded as heinous crimes, and they have brought a number of these people to trial.

That's one thing. The second thing, as regards the United Nations Fund for Population Activities, as far as I can see, I don't know how you can relate their contribution of $10 million to any of these acts of coercion that have been charged against China. The UNFPA is going in for programs that have nothing to do with that. On the contrary, the more there are going to be proper family planning practices, the more they are encouraged, the less there are going to be any of these kinds of acts of coercion that probably do occur, as indeed they occur in all countries.

Infanticide, by the way, is not a Chinese phenomenon. It occurs rather widely, including in Africa, but the infanticide rate has come way down in China according to all the figures that are available in terms of the boy/girl ratio at birth, which today is around 106 to 100—106 boys to 100 girls—which is about normal for a country like China. It's 104 to 100 in the United States, by the way, but China at one time was 117 to 100, so there has been a great deal of improvement.

Mrs. MEYERS. I do understand what you are saying, that the monies that we give them are restricted, that they cannot go for that, that it is not a large portion of the contribution. Still, as long as it is even tolerated, it sets a climate in the Congress here—and I'm not indicating that either of you have said that it was tolerated—but as long as there is that impression, then it gives those of us who are very supportive of family planning a very difficult time in this Congress.

Mr. SCHEUER. Thank you very much.

I am going to use my 5 minutes just to ask questions. I am going to ask unanimous consent that all members be permitted to ask questions in writing. We'll hold the record open for 10 or 12 days to get your answers. I don't have time to get your answers, so I'll just address a few questions.

If any of you want to address the current administration policy on family planning and abortion, I would invite you to do so, as Werner Fornos has already done.

I have met on a regular basis with several other Congressmen, with the top officials of the World Bank, and it's true that they relate that African countries are reluctant to borrow at comparatively high interest rates to finance family planning. They would much rather borrow to finance a pulp and paper mill or a petrochemical plant or a farm-to-market road because they can see the cash flow there to finance a loan at market interest rates, but they are reluctant to borrow for family planning purposes. So I think the problem is to find some soft money at very much below market interest rates.

They do tell me that they will find money for any projects that come across their table but that the problem is the scarcity of applications. Marshall, I guess this goes back to the mindset of the chiefs of state and their planning ministers who maybe give lipservice to family planning but in practical terms put it way down on the priorities list, because they don't make the applications.

Maybe you would like to respond to this, as well as any of the rest of you: What do we have to do to stimulate applications from the sub-Saharan African countries for well-conceived, thoughtful family planning programs and family planning-relevant programs, population-relevant programs? What programs can we get them to adopt that will change the mindset of the men, both the husbands and the ministers and the chiefs of state, to get them to, if not embrace family planning, at least to concur, permit their women to engage in family planning?

Marshall, I would ask you if you would be willing to come back sometime with your computer presentation, to demonstrate it to this committee, and we would ask other Members of Congress to come by. Have you ever done that before a congressional committee?

Ambassador GREEN. No; I haven't. I have done it for Cabinets in several countries. That is called the RAPID presentation.

Mr. SCHEUER. The RAPID, yes. Would you be willing to come by sometime?

Ambassador GREEN. I would.

Mr. SCHEUER. Well, we will certainly ask you to do that, and we will be in touch with you.

Mr. Isaacs, I would ask you this: The African countries, of course, have a colonial heritage, francophone and anglophone. The powers that gave them their independence 30 years ago have mostly changed their own laws on the subject of family planning, permissible contraceptive use, and abortion. Virtually all contraceptives, I believe, and abortion in various circumstances are legal in England, France, Italy, Spain now, and they are on the way to legalizing abortion in Ireland. Would you tell us the degree to which these countries are assisting their former colonies in bringing their laws and administrative practices up to date?

For example, are the French, who are practicing contraception to the point where many policymakers in France feel that it is endangering France—they have what you demographers call a negative growth rate—are the French helping their colonies make the necessary changes in the laws and administrative practices which they inherited from the French a generation ago when they achieved independence? The same thing with the British: Why are the English-speaking countries who have a British colonial heritage struggling with laws that inhibit either family planning or abortion, when both of these are totally employable at will and available at will in Britain? To what extent has Britain consulted with them? I think we would be interested in hearing that.

My 5 minutes are up. It has been a marvelous panel—thoughtful, provocative—as we could have expected from our past history, all of us with all of you. We thank you very, very much and we will be submitting additional questions in writing. Thank you. [See appendix.]

We will now hear from the second panel: Dr. Joseph Speidel; Nancy Harris; Virginia Ofosu-Amaah; and Dr. Sheldon Segal. All right. We are delighted to have you all.

We are going to have a little change in this panel. Instead of a rather loose 8 minutes, we are going to ask you to summarize in a strict 5 minutes, and that will give us more time. We have just under an hour left and that will give us more time to ask questions. I think the three of us were all very frustrated at being limited to 5 minutes for questions, so if we can get through your prepared testimony in 5 minutes—and we will be strict—at the end of 5 minutes, when the bell goes off, we will ask you to summarize right then and there, on the spot. This is because we really value and cherish the opportunity to ask you questions and to have some two-way communication.

Dr. J. Joseph Speidel, vice president of the Population Crisis Committee.

Dr. Speidel.

STATEMENT OF DR. J. JOSEPH SPEIDEL, VICE PRESIDENT, THE POPULATION CRISIS COMMITTEE

Dr. **Speidel.** Thank you, Congressman Scheuer and colleagues. I will try to dash through my comments here so we do have plenty of time for questions.

I am going to talk about implementation of family planning programs in sub-Saharan Africa, which I believe are the key to reducing rapid population growth in that region. These programs are dependent on three major factors: first, policy decisions to facilitate provision of family planning services; second, a desire for family planning among potential clients; and, third, the development of a delivery system for family planning services which is affordable, accessible, and acceptable.

I won't repeat anything more about population policies. I think that has been covered already by Steve Isaacs and others. I just would have one comment, and that is to say that the development community, the donor community, has got to be more persuasive with African governments to convince them of the need to include population concerns in their development planning. I don't think very much has been done along these lines on the part of organizations like the UNDP, the World Bank, and even AID.

I would like to turn to the desire for family planning among potential clients. As several of the previous speakers have pointed out, there are strong pro-natalist sentiments in Africa but I think there is also a very large unmet demand for family planning services. I would just like to mention a couple of facts that relate to this.

First of all, illegal abortion is epidemic in Africa. The thousands of illegal abortions that come in for treatment are really the tip of the iceberg. Those are the people who get in the worst trouble from that procedure. Obviously there are women willing to risk their lives to avoid having the next child.

Also, survey data suggest that there is substantial unmet demand for family planning services. Overall, from 30 to 64 percent of women surveyed by the World Fertility Survey or the Contraceptive Prevalence Surveys are candidates for contraception. This includes the 4 to 16 percent of women who wanted no more children, but it also includes the 23 to 60 percent of women who did not want a child immediately, so by virtue of wanting no more children or wanting to delay childbearing, some 30 to 64 percent of women surveyed were candidates for contraception yet only 10 percent of those women were using contraception. In other words, there is a 90 percent gap there.

Now I would like to turn to the service delivery system. I would just comment that in Africa by and large the decision has been made to tack family planning onto existing health networks, and these health networks are so weak that the net result is usually a very weak family planning system tacked onto an almost as weak health system.

I think the donor community has got to bear some of the blame for the relatively poor development of family planning services in Africa. Overall, some $600 to $800 million a year is needed to provide good access to voluntary family planning services, but the donor community is probably providing around 10 percent of that amount, and several of the previous speakers have noted the recent policy changes from the administration which have weakened the ability of the major actors on the scene to continue to support even that modest level of input.

We have heard about the UNFPA which, ironically its largest grant goes to Ethiopia, about $2 million a year. The UNFPA works in 42 countries in Africa, has by far the largest spread. IPPF works in 28 countries, and the IPPF had planned to support family planning in 13 additional countries when the policy decision was made to cancel their $12 million that they had expected from the U.S., which is about a fourth of their budget, so those plans to expand to additional countries have been shut down.

I would like to turn to AID now. Until recently they have given low priority to family planning programs in Africa. In 1981 they promised to expand the number of population officers, but some 2 years later there are only six bilateral programs and six full-time population officers in Africa. Now here there is a bright spot in AID's program, in that they have recently expanded the number of population officers in Africa. It is now about the equivalent of over 19 full-time positions.

But now I'll tell you the bad news, which is most of the story. Most of the needed technical assistance and support in Africa has got to come through nongovernmental organizations, and AID has cut the staffing for the Office of Population back from 54 to 37 full-time employees in the Reagan administration.

You have already heard about the policy changes, so I will summarize now by making seven specific recommendations: First, eliminate the Mexico City policy as a precondition for supporting overseas nongovernmental organizations.

Second, restore the eligibility of the IPPF and the UNFPA for funding without burdensome preconditions.

Third, restore the requirement that natural family planning providers offer objective information on a range of birth control methods and make referrals for other birth control methods, as is now required for all other providers of family planning services which get AID support.

Fourth, set a goal to increase United States population spending for Africa by $200 million, about 25 percent of the funds needed to make family planning services available. I would say about half of that ought to go through private and voluntary organizations that specialize in family planning.

And we certainly need to boost the staff of the Office of Population back up to somewhere around 75. I can't resist commenting that during the Reagan administration the Defense Department has found some 97,000 new employees. There are now over 1 million civilian employees working in the Defense Department. Somehow we ought to be able to find 38 additional employees to work on population.

Sixth, the United States should set a goal of providing $50 million annually to the UNFPA.

Seventh, the United States should set a goal of providing $50 million annually for direct bilateral population assistance to Africa.

Thank you.

[The prepared statement of Dr. Speidel follows:]

IMPLEMENTATION OF FAMILY PLANNING PROGRAMS IN AFRICA

Statement to the Hearing on Africa and Hunger: Population
by the Subcommittee on Natural Resources, Agriculture Research
and Environment, Committee on Science and Technology
James H. Scheuer - Chairman

J. Joseph Speidel, M.D., M.P.H.
Vice President
Population Crisis Committee
1120 19th Street, N.W.
Washington, D.C. 20036

October 17, 1985

I appreciate the opportunity to present testimony concerning family planning programs in Africa to Congressman Scheuer and other distinguished members of the subcommittee on Natural Resources, Agriculture Research and Environment. It is particularly important to address population problems in Africa because the African continent is the region where population pressures are the most severe and the consequences of failure to deal with these pressures are likely to be the most profound and tragic.

My involvement with population work goes back over twenty years and includes fourteen years of service at the Agency for International Development in the Office of Population, where I served as Chief of the Research Division, Deputy Director and Acting Director of the Office. For the past two years I have served as Vice President of the Population Crisis Committee.

My experience with population problems in Africa began in the late 1960s. Most recently I spent a month in Kenya in the summer of 1984 as an advisor to the U.S. A.I.D. Mission and the Kenyan government concerning the risks and benefits of contreception in Kenya. My comments today focus on the challenge of providing family planning service for the approximately 400 million people living in some 46 countries in sub-Saharan Africa.

Implementation of family planning programs is the key to reducing rapid growth rates in Africa. Successful family planning service program depend on three principal factors:

1. Policy decisions to facilitate provision of family planning services.

2. A desire for family planning among potential clients.

3. Delivery of family planning services which are accessible to and affordable by potential acceptors.

Population Policy

For many years most African governments considered family planning relavent mainly to health because birth spacing improved maternal and infant health. As economic circumstances have deteriorated over the past five years in many African countries development planners and other leaders have come to recognize that slowing rapid population growth is critical to the success of long term development aspirations. Some governments (e.g. Kenya) have designated slowing rapid population growth, as one of their top priorities.

Unfortunately, many of the old constraints still hold back adoption of strong population policies. There is a persistent notion that family planning and population work is a "foreign" or even a "genocidal" idea. Some countries are held back by concern over the balance of size and power between various tribal groups and the perception that public and popular demand for family planning services is low still persists.

More understanding of the impact of rapid population growth on development is needed so that African governments will commit themselves more strongly to family planning. Because policy commitment to family planning is inadequate, outside assistance is needed to strengthen population policies and to develop effective and comprehensive family planning programs in most African countries.

The desire for family planning among potential clients.

The nature and strength of pronatalist sentiment in the African setting is not adequately understood - but it is thought to be an important constraint on demand for family planning compared to other regions of the world. A few of the conditions cited are as follows:

It is well known that development is positively associated with demand for small families. Africa is the least developed and least modernized region of the world, so it is not surprising that high fertility ideals persist. High infant mortality has been claimed to limit demand for family planning in Africa. But it must be recognized that family planning in itself lowers the maternal and infant death rate, and a lower death rate has an uncertain impact on lowering the birth rate. Lowering infant and child mortality is an intrinsic good, but it should not be considered a prerequisite to family planning. In the absence of strong family planning programs, lower death rates result in higher growth rates.

Traditional African societies offer many cultural reinforcements for large families. For example, if the first 4 children must have the grandparent's names, it is an unusual family that chooses fewer than 4 children. If the tribe rather than an individual is responsible for a child's welfare, there is little pressure on individual mothers and fathers to constrain fertility.

Male attitudes also are important. In many places in Africa virility is still measured by the number of children fathered.

In spite of these factors evidence shows that there is an unmet demand for family planning. Illegal abortion is epidemic in Africa. At the Kenyatta National Hospital there are thousands of admissions every year of women who are ill from the consequences of mishandled abortions. Surely this is just the tip of the iceberg, illegal abortions are epidemic in the urban areas in country after country.

Survey data suggests that there is substantial unmet demand for family planning services. Data from 9 African countries showed that 4 to 16 percent of women surveyed wanted no more children and an additional 23 to 60 percent did not want a child immediately. Overall, from 30 to 64 percent of women surveyed were candidates for contraception, by virtue of wishing to delay or terminate childbearing. But on average only 10 percent of these women were using contraception. In 11 countries surveyed 1 to 26 percent of sexually active women exposed to pregnancy were using contraception. Contraceptive prevalence rates exceeded 10 percent in only 2 countries.

Demand for family planning services cannot be accurately measured on a theoretical basis. In countries where knowledge of and access to family planning is so limited, surveys are likely to underestimate demand. In some African countries surveys have revealed that only half of the women interviewed could name a single modern method of family planning. These women do not have what William James called "a live choice," a real option to limit their fertility.

Some social scientists have claimed there is little demand for family planning because "ideal" family size in African countries may be 6 or 7 and actual fertility may be 7 or 8. But we know that "ideal family size" is very malleable and subject to substantial declines when strong family planning services and adequate information about family planning is made available.

The service delivery system.

Providing quality family planning services in the African setting is a daunting challenge. Some countries, such as Mexico, were able to add family planning quickly to existing health and other social service networks. Things are seldom so simple in the African context. Only the weakest health or other social service systems exist. In Africa, leadership, management skills, medical expertise and infra-structures of all sorts are in short supply.

Family planning service delivery systems depend on funds, family planning commodities and most importantly on the leadership, knowledge and skills of the personnel running such programs. In addition, it is easy to overlook the need for warehouses, vehicles, personnel systems, financial systems and a long list of other things that make a modern program work. The knowledge and personnel skills which are in such short supply are in turn dependent on education and training. This overall lack of skills and infrastructure in Africa makes outside technical assistance critical.

The ability to operate a strong family program has been hampered by the almost universal policy decision of African governments to offer family planning only in the context of health care services. The result in many countries has been almost non-existent family planning tacked on to very weak health care systems. Even countries which have had substantial amounts of funds available, such as Kenya, have tended to pour these funds into the health system to the neglect of family planning. Preventive health services get second priority under the onslaught of sick people needing immediate help.

Policy and organizational reform that would give adequate priority to family planning service delivery is necessary for African governments. It is also important to deliver family planning services through other parts of the organized sector in Africa: private and mission hospitals, subsidized sales through commercial retail outlets, and other nongovernment delivery systems, such as those run by local family planning associations.

Sources of Support for Family Planning in Africa

The donor community, including the United States, must bear considerable blame for the paucity of family planning services in Africa. Overall some $600 to $800 million per year is needed to insure access to good voluntary family planning services for the 400 million Africans in subsaharan countries. The donor community has been providing only about $75 million or ten percent of the needed amount. (Excludes World Bank Loans of about $30 million per year in 1984 for Population, Health and Nutrition). The U.S. share was about $32 million in FY 1985, excluding funds provided to the UNFPA.

The United Nation's Fund for Population Activities

A major source of funds for African population programs ($33.7 million in fiscal year 1984) is the United Nations fund for Population Activities (UNFPA), which supports maternal and child health/family planning activities in almost every African country (42 nations). The largest UNFPA African grant ($2 million) is to Ethiopia, where the survival of pregnant women is seriously imperiled by famine and maternal depletion. However, the U.S. has eliminated $10 million of a promised $46 million in fiscal year 1985 and is now considering the termination of all U.S. funding for the UNFPA.

Nongovernmental Organizations

Nongovernmental organizations in Africa are dependent on outside funds and technical assistance from AID supported organizations such as the International Planned Parenthood Federation (IPPF), Family Planning International Assistance (FPIA), the Pathfinder Fund, and the Association for Voluntary Sterilization (AVS).

Private and voluntary activities support creative, community-based maternal and child health and family planning projects in about 30 African nations. IPPF — the world's largest voluntary family planning association — supports independent, nongovernmental national family planning organizations headed by indigenous private sector African leaders in 28 African nations. Their fiscal year 1984 budget was $10.2 million for Africa.

IPPF planned to extend support to family planning in 13 additional African countries and to establish new sub-regional centers for training and technical assistance, but this was not possible because in December 1984 the U.S. cancelled a planned $12 million contribution to IPPF, about one fourth of IPPF's budget.

The Agency for International Development

Until recently, AID has given low priorities to African family planning activities. In 1981, AID promised to increase substantially the number of population officers in Africa. Two years later, there were still only 6 full time population officers in Africa and 6 bilateral programs. Over the past year, AID has increased population officer positions and now there are the equivalent of 19.5 full time population officers in regional and country offices. Bilateral programs in FY 1986 are projected to provide $24 million of support, but only to 8 countries.

Much of the needed technical assistance, funds, and commodities must come through nongovernmental organizations. Yet, during the Reagan Administration the staff of AID's Office of Population, which funds and manages these programs, has been cut back by 31%, from 54 to 37 full time professional employees. There are only the equivalent of two full time population officers in AID's Africa Bureau in Washington to back up the bilateral programs in Africa.

About half of U.S. foreign aid for family planning now flows through efficient U.S. based nongovernmental organizations and their sub-grantees overseas. The effectiveness of these centrally funded programs is threatened by AID's August 1984 policy, (announced at the Mexico City International Conference on Population) to cut off support for any organization which provides funds to any foreign organization that has any involvement in abortion related activities - even using their own funds.

IPPF has already lost its AID funding because of this policy. Most research, training and information activities go through universities which are unlikely to agree to serve as the administration's anti-abortion policemen overseas. The new policy may result in the reallocation of up to $100 million in nongovernmental programs to usually less effective government-supported population programs. In short, the effectiveness of AID's family planning program is in jeopardy.

A new policy at AID which overemphasizes natural family planning (NFP) and funds organizations which do not provide a variety of family planning methods will divert resources from effective programs to those which are less effective. The Reagan Administration has increased funding for NFP from about $800,000 to the current $5 million per year.

Precise estimates of the impact of these policy changes are not possible - but they all can be expected to damage family planning programs. A shift to bilateral programs from more efficient private, nongovernmental organizations might increase the annual program cost per family planning client from about $10 to about $20. Up to 5 million fewer couples would have access to family planning services as a result. The Administration has also reduced its request for population foreign aid from the $290 million appropriated for this fiscal year to $250 million for fiscal year 1986. A loss of $40 million would deny family planning to as many as four million couples. And the $8 million shifted into natural family planning will also result in less effective family planning programs. Altogether, Reagan

Administration policies threaten to cut off family planning services for some 10 million couples in poor countries. The greatest impact is likely to be in Africa where programs are the most fragile and where dependency on threatening outside funding sources (UNFPA and the nongovernmental organizations) is greatest.

The Administration and some members of Congress, have pushed through these damaging policy changes which piece by piece are dismantling AID's population program. The President's anti-abortion crusade has become an anti-family planning policy. Unless the misguided policy is reversed, it will continue to seriously damage African family planning programs, hamper social and economic progress, devastate other family health efforts and increase abortion. The most vulnerable region - Africa - will suffer the most. Only Congressional action can reverse this trend - a list of specific action recommendations relating to family planning for Africa follows:

Recommendations

1) Eliminate the Mexico City policy as a precondition for supporting overseas nongovernmental organizations.

2) Restore eligibility of the IPPF and UNFPA for funding without burdensome preconditions.

3) Restore the requirement that natural family planning providers offer objective information on a range of birth control methods and make referrals for other methods of birth control - as is now required of all other AID supported family planning service providers.

4) Set a goal of increasing US population spending for Africa by $200 million annually, about 25% of the funds needed to make family planning services available in Africa.

About fifty percent of the funding increase should support the activities of private and voluntary organizations which now provide the committed core of health experts, community-based leaders and innovators for much African family planning. Rapid expansion of services cannot occur in Africa without substantial private sector involvement.

The other half should be provided to African governments, either directly through U.S. bilateral assistance or indirectly through an increased U.S. contribution to the UNFPA.

5) Of the total additional amount, the U.S. should set a goal of providing $100 million annually to private and voluntary organizations that specialize in family planning, a portion of which should be available to the International Planned Parenthood Federation.

To manage this amount AID must restore the population personnel cut from the Office of Population and increase its staff to at least 75. (By way of comparison, the Reagan Administration has increased civilian personnel in the Department of Defense by 97,000 to over 1 million.) The U.S. should encourage and support the current efforts of IPPF and other private and voluntary organizations to promote women-to-women family planning programs and the participation of church groups, self-help organizations and grassroots associations in the delivery of family planning services. African "market women" should be encouraged to participate in the social marketing of contraceptives.

6) The U.S. should set a goal of providing $50 million annually to the UNFPA for activities in Africa in addition to a core U.S. contribution to the UNFPA for the support of family planning worldwide.

The U.S. must maintain and increase financial support for the UNFPA. In addition, the U.S. should encourage current UNFPA efforts to foster indigenous African leadership for maternal and child health and family planning programs throughout Africa.

7) The U.S. should set a goal of providing $50 million annually for direct bilateral population assistance to Africa.

The current U.S. bilateral population assistance program reaches only 8 African nations. Not all, but increasing numbers of African nations want bilateral population assistance from the U.S. (Many still prefer multilateral assistance). However, the United States should continue to increase the number of AID population officers in Africa in order to further development of additional U.S. bilateral population assistance programs in Africa. Current bilateral programs should be expanded and better funded, and new bilateral agreements should be established.

Conclusion

The $600 million to $800 million per year needed from all indigenous and donor sources for family planning program expenditures by government and private agencies to ensure access to good voluntary family planning services will increase each year as the number of couples of reproductive age increases.

An increase in overall family planning expenditures in Africa to $600 to $800 million could result in an increase in use of contraception from the current estimated 4 to 5 million couples to 30 to 40 million couples. This increase in the practice of family planning would likely be accompanied by the annual prevention of:

- 18 million unwanted births
- 4 million spontaneous and about 7 million induced abortions
- 75,000 deaths of women in childbirth
- 2 million infant deaths under one year of age.

Mr. SCHEUER. Thank you very much, Dr. Speidel.

Now we will hear from Nancy Harris, former director of the Africa Regional Office of Family Planning International Assistance. Ms. Harris is presently deputy director of the Private Enterprise Family Planning Project.

Ms. Harris.

STATEMENT OF NANCY HARRIS, DEPUTY DIRECTOR, PRIVATE ENTERPRISE FAMILY PLANNING PROJECT, JOHN SNOW, INC.

Ms. HARRIS. Thank you, Mr. Chairman. I am grateful for this opportunity——

Mr. SCHEUER. Would you pull your microphone a little closer, please?

Ms. HARRIS. I am grateful for this opportunity to testify and grateful that at least two women—and one African—have been included on this panel dealing with a subject that is very close to the hearts of women.

I have just returned about 6 weeks ago from 9 years of living and working in Africa. During that time I traveled extensively in 30 of the 50 countries, helping governmental and nongovernmental organizations to design and implement family planning programs. Because of my job and the nature of my job, I met a lot of people over that time and a lot of visiting Americans. The most common question I got asked is, "Why aren't family planning programs"—or population control programs, and they are different—"working in Africa?"

When I was thinking about how to respond to that, I have come to the conclusion that we really haven't put very many resources into those programs so we can't say that they are not working. We haven't really tried. Others have quoted statistics to that effect, so I won't repeat them.

That doesn't say, however, that we cannot be cautiously optimistic about the possibility of achieving success. I think the first panel was somewhat frightening in terms of the statistics and what is likely to happen. However, based on my experience and based on the small- to medium-scale efforts that have been mounted, I think that we can say with confidence that programs which have met the people's needs and which have gone halfway have met with remarkable success and sometimes in very, very short time frames. On a grassroots level, everywhere in Africa—from taxi drivers in Lagos to rural farmers in Zambia—people are citing the economic situation as part of the reason that they would like to adopt family planning, and the interest has grown tremendously on a grassroots level over the last few years.

Programs do need to be designed with social realities in mind, and I would like to address the problem of men which you raised. I think there is a negative stereotype of African men as totally opposed to contraception which is fairly prevalent. I don't think that African men deserve all the negative press that they have received. It is true that they are proud of their virility and their fertility and fairly conservative in their views.

African family life is suffering from high levels of alcoholism, especially among men, and disruptions related to the job situation, heads of household being absent. However, men are the main decisionmakers in Africa and are likely to be in the near future, and I believe they do want what is best for their wives and their children, so what this means is that information programs have to be taken out of MCH clinics, which in Africa cater to mothers and babies and women, not teenagers and men of reproductive age, and these have to be moved out where people work and where they live. One example of such a program is in Zimbabwe, where condoms have been distributed in bars where men congregate. FPIA has started to support a program in Nigeria with the Ports Authority to offer condoms with paychecks. This has proved to be enormously popular. The condom is the only currently available method for men, and it is underutilized in Africa, partly because of cost and availability.

As of early 1985, because of hard currency problems, there was virtually no importation commercially of condoms in Nigeria and Zambia, for example. Other places, they are available but very expensive. Sometimes—yes—well, sometimes this leads to more than one use per condom, which is fairly prevalent in Africa, and that has sort of predictably negative results.

I think the other aspect we have to focus on is community-based programs and using existing infrastructures. Zimbabwe has dramatic success, possibly 27 percent prevalence, using a commmunity-based approach. Other projects have also. Mandaeleo Ya Wanawake in Kenya should be an example for nationwide community-based programs in other countries. Programs must go out to where women are.

Another infrastructure that should be used is the church groups and mission hospitals. In sub-Saharan Africa in many countries they still make up up to one-third of the rural hospital beds, and some of the missionary groups which have their basis in the United States—the Presbyterians, the Seventh-day Adventist Church, other churches—have outstanding health programs which could do more to promote family planning.

Finally, I would like to say a word about the private sector, and this is one of the most exciting new ideas. We have found that there is a tremendous potential to promote it among private sector organizations. Industries like textiles and tea and other industries which employ women are a resource base for providing this service. Women have accepted it. They like the convenience of having family planning close by, having the availability of sometimes expensive contraceptives close at hand. Employers are very well aware of the economic costs of maternity leaves and other problems related to women workers, and they embrace these programs and show a willingness to finance them, which is something that is becoming increasingly important.

And so I would like to summarize by saying that despite the enormous constraints, it cannot be said that African programs are a failure because we haven't really tried. If we are going to stem the tide of population growth, we must address the unmet need for family planning with programs that will provide innovative approaches and culturally sensitive approaches.

Thank you.

[The prepared statement of Ms. Harris follows:]

TESTIMONY FOR SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE, RESEARCH & ENVIRONMENT

October 17, 1985

STATEMENT OF NANCY PENDARVIS HARRIS

FAMILY PLANNING PRIVATE ENTERPRISE PROJECT

THE JOHN SNOW PUBLIC HEALTH GROUP, INC.

Mr. Chairman. I am grateful for the opportunity to testify at these hearings on Africa and Hunger. I am currently Deputy Director of the Family Planning Private Enterprise Project, an innovative effort to provide family planning services through the private sector which can eventually sustain those services without subsidy. Previously, I was Regional Director for Africa of FPIA, the international division of the Planned Parenthood Federation of America. I just returned, six weeks ago, from nine years of living and working in Africa. During this time I traveled extensively in thirty of Africa's some fifty nations, assisting governmental and non-governmental agencies in planning and implementing family planning service programs. Owing to the regional nature of my job, I have had the opportunity to meet with leaders, government officials, health professionals, concerned individuals, reporters and politicians from all over Africa as well as from the U.S. and other countries. The most frequent question American visitors ask me is, "Why aren't family planning (or 'population control') programs succeeding in Africa?"

Pondering this question leads me to a startling conclusion: we are only beginning to provide any significant support to the right kinds of service programs in Africa. The World Bank, for example, devoted a large part of its 1984 World Development Report to population, focusing on Africa. However, the Bank is only beginning to mobilize large-scale financial resources to address this problem. Four years ago, there were fewer than six World Bank-supported basic health care projects in Africa where family planning was emphasized. The same holds true for AID-funded programs. AID's population program has begun to focus on Africa in the last two or three years. Still, overall dollar funding for Sub-Sahara Africa is low, less than $60 million in 1984, with only two-thirds of this in service delivery programs. There are only about twenty population officers for the entire continent, and this represents triple the number three years ago. Likewise, the International Planned Parenthood Federation's (IPPF) controversial shift of emphasis to Africa took place concurrent with crippling funding cuts. In sum, there have been far too few resources mobilized in Africa to support family planning service programs.

This is not to say that we cannot be cautiously optimistic about the possibility of achieving success. Although large scale efforts have yet to be mounted, we do have a growing experience with small to medium scale programs. Others have testified on the enormous cultural, political and policy constraints involved in implementing family planning programs in Africa. The effect on these constraints cannot be minimized. Nevertheless, based on my seven years experience in family planning in Africa, I can say with confidence that programs which have met peoples' needs half way have been dramatically successful, sometimes in surprisingly short time frames. On the grassroots level, everywhere in Africa, individuals from taxi drivers in crowded

Lagos to rural farmers in Zambia cite the "economic situation" as the reason for their interest in family planning.

Programs do need to be designed with social realities in mind. Take the problem of men, for example. A negative stereotype of African men as completely opposed to contraception appears to be prevalent. I don't believe African men deserve all the bad press they have received. They are certainly proud of their virility and fertility and conservative in their views. Also, African family life has suffered from high rates of alcoholism, particularly in men, and socio-economic disruptions caused by long absences of heads of households in cities and towns. But men are still the main decision-makers in Africa, and they do want what is best for their wives and children. So, information and service programs need to move out of MCH clinics which in Africa cater to mothers, babies and old men (leaving out teenagers and men of reproductive age). Information must be provided where people live and work. The Childspacing Association of Zimbabwe, for example, provides condoms through bars, where men congregate. A new FPIA-funded program in Nigeria offers some 10,000 Nigeria Ports of Authority workers condoms at the time they collect their paychecks. This has already proven popular. Also, male fieldworkers counsel men, leading to the acceptance of other methods.

The condom, the only currently available male contraceptive, is underutilized in Africa partly because programs are directed at women, but also because of cost and availability. Because of the shortage of hard currency, condoms became virtually unavailable in many countries, such as Nigeria and Zambia, by early 1985. When available, they are relatively expensive to purchase commercially in most African countries--

and this leads, at times, to more than one use per condom, with predictably negative results. Programs to increase availability and access to condoms in commercial and other sectors, as well as social marketing schemes, are just getting off the ground in Zambia, Kenya, Sudan, Nigeria, Ghana and elsewhere. More needs to be done and policy dialogues with governments should encourage the lifting of duties and restrictions on contraceptives, following Kenya's lead.

The scarcity of infrastructures to absorb family planning programs in Africa is disturbing, but even more disturbing is underutilization of existing infrastructures. The Pathfinder Fund supports a successful and growing community-based distribution program run by Maendaleo Ya Wanawake, Kenya's nationwide women's organization, which should be a prototype for such programs throughout Africa. This program uses trusted rural women leaders trained to counsel and provide services in their own communities. The Childspacing Association of Zimbabwe is an outstanding example of a program which has used a community-based approach to achieve a national contraceptive prevalence rate of 27 percent. Church groups are another underutilized resource. Mission hospitals still account for up to one-third of rural hospital beds in many African nations and missionary groups--many of them U.S. based--need to be encouraged to expand services in their primary health care programs and women's groups. It is important to use groups people know and trust. FPIA has been highly successful in working with such groups. The most widely publicized example is the Chogoria program, which has achieved a thirty percent contraceptive prevalence rate in a very conservative rural area of Kenya. The program also offers sex education for youth through the Presbyterian Church and local schools.

Many churches, such as the Seventh-Day Adventist Church and the Presbyterian, Anglican and the Lutheran Churches, have fine health programs in Africa and could do more to promote family planning. Even in the area of voluntary sterilization, one of the most sensitive areas in family planning, there have been encouraging successes. By working with the local medical community and being sensitive to the community's needs, an Association for Voluntary Sterilization (AVS) program in Sierra Leone has succeeded in achieving nearly nationwide availability of tubal ligation for women who elect to have this procedure.

Finally, the experience of John Snow, Inc. (JSI) in Kenya, and FPIA and others elsewhere, has demonstrated the potential to expand family planning in Africa through private enterprise. Virtually every large employer in Africa offers health services to its employees. These facilities have proven to be ideal locations for family planning services. Not only do women appreciate the convenience of having counselors and sometimes hard to obtain or expensive contraceptives close at hand, but JSI found that employers, who are well aware of the economic cost of generous maternity leave policies and maternal depletion, embrace such programs. Employers are generally willing to provide co-financing, which could lead to self-sufficient programs. In the industries where many women are employed, such as textiles and tea, there is a tremendous potential to reach large numbers of interested women.

In sum, Mr. Chairman, despite enormous constraints, it cannot be said that family planning programs in Africa have been or are likely to be, a failure. On the contrary, if there is any hope of stemming the tide of drought, starvation and depletion of natural resources in Africa, we must address population. There must be large scale donor and host country input of human and financial resources in family planning programs combined with a willingness to try innovative and culturally sensitive approaches.

Thank you.

Mr. **Scheuer**. Thank you very much, Ms. Harris.

Now we will hear from Virginia Ofosu-Amaah, former Principal Secretary of External Economic Relations of the Ministry of Finance and Economic Planning in Ghana. We are delighted to have you here as our guest, Mrs. Ofosu-Amaah. Please proceed for approximately 5 minutes, and then we will have a chance to question you when we finish with the panel. Your full prepared testimony will be printed in its complete form at this point in the record.

STATEMENT OF VIRGINIA OFOSU-AMAAH, FORMER PRINCIPAL SECRETARY OF EXTERNAL ECONOMIC RELATIONS, MINISTRY OF FINANCE AND ECONOMIC PLANNING OF GHANA

Mrs. **Ofosu-Amaah**. Thank you very much.

Mr. **Scheuer**. Would you pull the microphone a little bit closer to you, please?

Mrs. **Ofosu-Amaah**. Thank you very much, Mr. Chairman.

I would like to express my appreciation for the opportunity to testify before this committee on a problem which has come to be realized as a major constraint to African development. As the previous panelists have already discussed, the demographic situation in sub-Saharan Africa is very serious. Sub-Saharan Africa is the only region which has a high fertility which is not declining and high population growth rates. I wouldn't like to go into details because these have been—oh, sorry. May I start? Yes, it's on.

Mr. **Scheuer**. Is your mike working?

Mrs. **Ofosu-Amaah**. Yes, it's working.

Mr. **Scheuer**. Maybe you've got the wrong mike. Point it down a little bit.

Mrs. **Ofosu-Amaah**. Sorry, Mr. Chairman. I hope it's clearer now.

Mr. **Scheuer**. It's very good. Thank you.

Mrs. **Ofosu-Amaah**. I think, as I said earlier, the demographic situation in Africa has already been covered by the previous panelists, and I would like to go on to mention briefly some of the determinants of the high fertility in Africa. I think these are factors which sometimes are not discussed and sometimes are not understood by program planners. These determinants are social, economic, cultural, and religious.

Now one of the determinants is the fact that Africa is still an agricultural country and depends heavily on primitive agricultural methods, using primitive tools for cultivation and depending heavily on women as the main food producers in Africa.

The second determinant is that children in Africa are regarded as security in old age. This is very important in Africa.

Third, it is important to know that marriage in Africa is universal and people marry very early in Africa. By the age of 15 or 18 many women in Africa would have been married. In Nigeria, for instance, the World Fertility Survey data showed that by the age of 15, more than 50 percent of women would have been married. This is important in discussing the high fertility rates in Africa.

The other problem is the low literacy rate among women in Africa. I think about one-third of the adult population in Africa is literate, and this is very important, since the World Fertility

Survey has also established an inverse relationship between education and fertility. The other factor is that women are mainly farmers, as I have already mentioned, and they depend extensively on child labor for land clearing, for harvesting, for fetching water, and to assist them in trading purposes.

The other issue is the high infant and child mortality rates in Africa which have already been mentioned. This is a factor which compels many women in Africa to have many children, to make sure that some of these children would survive.

These are, to me, some of the important determinants of fertility in Africa. The issue about the lack of knowledge of reproductive biology and the lack of contraceptives has already been discussed. Now it has also been mentioned that family planning is one of the main strategies for fertility reduction. This is a program that is being followed by many African countries.

It has also been noted that contraceptive use in Africa is still very low. Generally it is about 10 percent. The reasons for this are many. Some of them have been mentioned, for instance, the linkage of family planning programs to the health system which covers only about 30 percent of the population, mainly in the urban areas. Then the lack of safer methods of contraception, this is also a problem because one has to develop contraceptives which are acceptable to the population in a country, taking into consideration their social practices, their cultural beliefs, and their religious beliefs.

To me the most important constraint is the failure of program planners to understand what I call the psychosocial factors which influence fertility decisions in Africa. Do we really understand at what stage in a woman's life she makes that decision to have 7, 8, 9, or 10 children? I don't think this is understood, both by those people outside Africa as well as those people in Africa. Do program planners really appreciate the intense desire on the part of African men and women to have many children? I think, until some of these factors are understood, I don't think the family planning programs that we are trying to implement in Africa will have any appreciable impact.

I would like to make a few suggestions. It is quite clear that family planning programs are being offered as family planning programs basically in Africa. One is not looking at some of the other developmental programs that, in the African context, will have any appreciable impact on fertility reduction. Here I would like to suggest that, looking at population, one should take a wholistic view of the population issue and look at the various ramifications.

This is making the point that if one should be able to implement meaningful family planning programs in Africa, then one should cover such areas as female education, which I think is very important; female employment, such as having programs which will provide income-generating activities for women; improving child survival in Africa because the infant and child mortality rates, as has already been said, are very high in Africa, and this is the only way of assuring women in Africa that their children will survive.

In addition to making information on contraception and services available, these are some of the recommendations that I would like to put before this committee. Thank you very much, Mr. Chairman.

[The prepared statement of Mrs. Ofosu-Amaah follows:]

Women and the Population Question in Sub-Saharan Africa

Mrs. Virginia Ofosu-Amaah

Introduction

In the past decade or so, many developing countries, particularly in Asia and Latin America have made considerable progress towards the reduction of their high fertility rates. Unfortunately, this progress or decline in fertility is not being experienced in the Sub-Saharan African Region. This Region still has the highest rate of natural increase in the world today. Its annual growth rate is about 3%, and infant mortality rates (IMR) are the world's highest. It is estimated that more than one out of ten babies born in Sub-Saharan Africa die within one year of birth, i.e. seven times the IMR of the developed world. Moreover, maternal mortality is at least ten times the rate in the developed world. The birth rate, which is equally high has remained stable within the past 30 years.

These demographic characteristics of Sub-Saharan Africa are peculiar and extraordinary. It is estimated that by the turn of the century Africa's population of 359 million in 1980 will double and more than triple by the year 2020. In countries like Kenya, with growth rates of 4% (higher than the Regional average), the doubling of the population will occur even earlier.

In the past twenty years, development experts have recognized that high population growth rates are a serious constraint to African development - a fact belatedly recognized by many African Governments. The drought and famine of recent times, in the Sahelian countries, have dramatically heightened this awareness. Lagging behind in economic development and burdened with a primitive agricultural system, Africa is unable to feed its growing populations. It has therefore become a net importer of food using its scarce financial resources to the detriment of its already poorly-functioning economic and social infrastructure.

Determinants of Fertiity in Africa

African society is pronatalist, placing a high premium on fertility. The determinants of the extremely high fertility rates in Africa (total fertility rate is about 6.6/women) are conditioned by cultural norms, religion, social institutions and the traditional economic system. A comprehension of these determinants is essential for the effective implementation of programmes aimed at reducing the high rates of population growth.

Agricultural System

Sub-Saharan Africa is predominantly agricultural with heavy dependence on traditional and subsistence methods of farming. Women are the main food producers while men are engaged largely in cash-crop farming. Men and adolescent boys usually fell trees and clear land for cultivation while women are responsible for planting and harvesting with the assistance of other children. Under the present system of farming, therefore, child labour is extensively used and thus the need for large family sizes. A family's status and wealth in such agrarian societies are assessed on the basis of its size. In Africa, however, even in the urban areas, where some modernization has taken place and agrarian pursuits are of less importance, a large family is still a status symbol.

Social Security

Since about 70% of Africa's populations live at subsistence level, social security systems or alternative institutions have not been developed to cater for the needs of old age. Children are therefore looked upon as an economic asset and as security in old age and at other periods of disability.(b)

Marriage

Marriage is virtually universal for the African woman and girls are married off at an early age. In Ghana, for example, the median age at first marriage is about 18.1 years and childbearing starts soon after. It is estimated that the proportion of women still unmarried in Africa is only around 5% or less in the age group 25-29 and declines to 3% or less thereafter. In Ghana, for instance, by age 50, only 0.4% of women have never married. In Nigeria, according to the 1984 Fertility Survey 51% of the sample of women were married by 15 years of age, and 75% by 18 years!

Although divorce rates are high throughout Sub-Saharan Africa, re-marriage rates are equally high ensuring that only few women of child-bearing age are outside sexual unions at any particular point in time. A woman's esteem in the community is largely judged by the number of children she has. On the other hand, an infertile woman is usually despised, ostracised, abandoned or divorced. Infertility is therefore considered a social stigma in Africa and is regarded as the greatest of all personal tragedies that could befall a woman.

Moreover, the existing social structure which depends largely on the extended family system encourages high fertility because of the support obtained in the care of children from other members of the family.

Education and Employment

The generally low educational status of African women which is linked to early marriage has a significant influence on fertility levels. World fertility survey data have confirmed the inverse relationship between fertility and the educational level of women. Women with less than 6 years of education have significantly higher fertility than those with more than 10 years of schooling (i.e. high school education). Secondly, educated women have healthier babies, are more likely to use contraceptives, have more and better employment opportunities outside the home and are more economically independent.

The work status of women is another important determinant of fertility. Women in the agricultural sector tend to have higher levels of fertility than those employed in the modern sector away from the home. Since most African women are food farmers engaged on family farms, it is not surprising that their fertility rates are high.

Child Survival

The uncertainty of infant and child survival manifested by the high infant and child mortality rates, already referred to, compel women to have many children to ensure the survival of some of them. Although some improvement has been observed in some countries in child survival rates, this is yet not reassuring to many African communities.

Knowledge of Reproductive Biology and Contraception

Among African communities there is still little scientific knowledge about reproductive biology and contraception. Information about, and access to effective and safe means of contraception is also limited.

Family Planning Programmes

Family Planning programmes are an important strategy adopted by many developing countries to reducing the high fertility and eventually the high population growth rates. In spite of the population problems facing African countries, only a few have as yet committed themselves to reducing population growth. Some African governments are still very pro-natalist - Sudan, for example, recently announced its intention to introduce incentives for large families. Even in those countries such as Ghana and Kenya, where family planning programmes have been in existence for many years, contraceptive prevalence rates remain low, generally less than 10%.

Family Size Norms

Many reasons are adduced for this state of affairs. The most important, however, in my view, is the failure by programme planners to appreciate the intensity of the desire for large families; the psychosocial processes which govern the establishment of family size norms in the consciousness of men and women and the point in time at which this becomes ingrained in African men and women. This may partly explain the low contraceptive use and continuation rates in Africa since by the time a woman takes advantage of family planning services, she may have already decided on the number of children she would want to have. Even most women who accept family planning use these services for spacing only and not consciously for limiting family size (and those who discontinue contraceptive use are those who do not want any more children).

Until these psychosocial factors are understood and until the correct interventions are applied at the appropriate time in a woman's life, these will continue to be a barrier to the successful implementation of programmes.

Other important problems with family planning programmes in Africa relate to:

1) the linkage of family planning services to the health system, in particular, maternal and child health services. Since these services reach only between 25% and 30% of Africa's populations (i.e. mainly in the urban areas), accessibility, proximity, frequency of services and the ready availability of supplies leave much to be desired.
2) the fact that family planning programmes are being implemented without reference to other developmental considerations, which in the African context, would have a significant impact on fertility

regulation such as female education and other women's programmes.

3) the lack of active involvement of community organizations which may be in a position to influence cultural practices away from pro-natalism.

4) the virtual non-participation of men in population and family planning programmes.

5) the unavailability of safer methods of contraception that may be socially acceptable.

Recommendations

It is obvious from the above discussion that the most important factors in fertility reduction are the length of female education, child survival, women's employment status, information on contraception and availability of services. This means that raising the status of women should be an essential component in any attempt to solve the population problem in Africa. It is therefore important that the population question should be looked at in its entirety rather than concentrating on the provision of family planning services per se.

It is with these considerations in mind that the following recommendations are being made for the attention of the committee:

1) programmes should be formulated to improve female enrolment in schools and also to reduce keep female drop-out rates. Such programmes should emphasise vocational training relating to skills that they may require later, particularly in the areas of

food production, food processing and preservation. Where women are reached through functional literacy programmes, it is important to impart marketable skills tailoured to the needs of the local economy.

2) new options and opportunities for income-generating activities should be provided for women. Such opportunities may be community-based and may emphasize cash remuneration since women's control over money increases their decision-making role in the family.

3) agricultural practices should be improved to make it possible for women to depend less and less on child labour. This will call for the provision of appropriate technology, especially improved tools and equipment for farming purposes.

4) for food processing and food preservation, which are important areas of employment for women, appropriate labour-saving devices should be provided.

5) although women are the main producers of food in Africa, the present extension services rely mainly on males for agricultural advice to farmers. The services ignore the needs of the female farmer. The training of female extension workers will ensure that such services reach the large numbers of women on whom Africa depends to satisfy its food requirements.

6) special credit facilities should be made available to women to assist them in their major areas of employment, i.e. farming, food processing and trading.

7) research should be carried out into:

   a) contraceptive technology including traditional methods, such as breastfeeding, which would be both safe and culturally acceptable;

   b) the psychosocial aspects of the determinants of family size norms;

   c) the causes and treatment of infertility.

8) programmes should then be developed to sensitize, in a systematic way, young people at an early enough age on their fertility behaviour, population questions and implications of population growth so as to minimize teenage pregnancies and to influence the attitudes of young people to family size norms. Such issues should also be included in functional literacy programmes.

9) men should be included in family planning programmes.

10) the coverage of family planning services could be extended by utilizing other development workers, such as agricultural extension and community development workers after these have been given some training.

11) maternal and child survival programmes should be designed to include activities which will improve (rapidly and at low-cost) the health of the mother and child e.g. the training of traditional birth attendants to improve on their practices, weaning food production from local food items, immunization, etc.

In conclusion, the thesis is that the major vehicle for creating demand for family planning and for overcoming the unacceptably high population growth rates in Sub-Saharan Africa, is not by the mere supply of contraceptive services but principally by strategies for improving the status of women, fully appreciating their central role in African economic and social development and in programmes that assure the survival and development of their children.

Mr. **Scheuer**. Thank you very much, Mrs. Ofosu-Amaah. We appreciate your testimony.

Now, Dr. Sheldon Segal, director of the Population Sciences Division of the Rockefeller Foundation. We are happy to have you here. Please, everybody else on the panel has taken roughly 7 or 8 minutes, so I think you might as well also, and then we should still have some time for questions.

STATEMENT OF DR. SHELDON SEGAL, DIRECTOR, POPULATION SCIENCES DIVISION, ROCKEFELLER FOUNDATION

Dr. **Segal**. Right. Thank you, Mr. Chairman. Actually I was thinking that perhaps I can give you back some of those valuable minutes, because I do think the question period is a very vital part of the hearings proceedings, so I would like to just simply give you the two summary issues that I present in my prepared testimony and which I had planned to give in my verbal presentation.

These are simply this: I think that there is a very important need for developing indigenous scientific leadership within the continent. Many of the things you have heard from other panelists indicate that there are still scientific questions to be answered in terms of social science issues, as we just heard, and in terms of medical issues, both research and delivery system issues, which require the participation of indigenous leadership.

Political leaders in Africa deserve to have available for them indigenous advice that they can depend on. One of the panelists said that she was often asked the question by visiting Americans: Why are we not successful in the programs we are undertaking? Well, that tells us a lot. They are not our programs. They are African programs, and until the African leaders have the advice that they can depend on from their own colleagues, there is going to be a serious problem confronting serious implementation of these programs.

The second conclusion I would make is an optimistic one, and that is that I believe that when programs are implemented in either the public or private sector, there are contraceptive tools available that are adequately suited to the needs, given the sociocultural conditions in Africa. I think that the advent of the long-acting subdermal implants can be in a sense revolutionary with respect to the success of family planning efforts, either private or public, in Africa. This new method of contraception has several of the important characteristics that other speakers have alluded to. The method is highly effective and safe. It is long-acting, so that it does not require a very complicated delivery system. It is reversible, and it does not require the participation of a trained physician, a commodity which is very scarce in the African setting.

These, then, Mr. Chairman, are the two conclusions I would bring to you, that there is a great need for indigenous scientific leadership and, secondly, that the contraceptive tools are available if we develop the means to make them available on a voluntary basis to the people who wish to use them. Thank you.

[The prepared statement of Dr. Segal follows:]

TESTIMONY
of
Sheldon J. Segal
Director for Population Sciences
Rockefeller Foundation
1133 Avenue of the Americas
New York, New York 10036

U.S. House of Representatives
Sub-Committee on Natural Resources, Agriculture
Research and Environment
Committee on Science and Technology

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As the new nations of the African continent seek to improve the quality of life for their people, they confront many long range problems that require understanding and patience. Africa continues to lag behind Asia and Latin America in its demographic transition and its population growth surpasses that of other regions. The population of Subsaharan Africa has more than doubled in the thirty years between 1950 and 1980, reaching 407 million by mid-1984 and, with an annual rate of growth of almost 3 percent, it is expected to double to over 800 million by 2010. With fertility rates at record high levels and mortality declining but still at unacceptably high levels, rapid population growth will continue well into the 21st century in Africa. While many African countries have official population policies, and there is growing concern with current population growth and distribution trends, they are at an early stage of development of family planning programs and other policies and programs that would influence these population trends.

In the past two years there have been signs that attitudes toward family planning are changing in Sub-saharan Africa. Governments are becoming more aware of the negative effects of rapid population growth for development and are increasingly interested in population programs. At the World Population Conference in Mexico City, African countries expressed concern about population growth in their region--a marked change of tone from the Bucharest Conference a decade before. Several African countries (including Nigeria, Kenya, and Zimbabwe) have expressed interest in formulating national population policies and developing family planning programs. Generally, the

English-speaking countries are further along than the French-speaking countries in their population interests. At international meetings--such as the Second African Population Conference held in Arusha, Tanzania, in January 1984 and the Conference on Reproductive Health Management held in Sierra Leone in November 1984--it has become clear that an energetic core group of African health professionals concerned about fertility-related problems is evolving. At the same time, the demand for family planning among Africans and the interests of political leaders in family planning may be moving ahead of the commitment of health professionals to provide services, and is certainly moving ahead of the technical apparatus and structure.

Development and population trends are closely interrelated and both require sustained attention and resources. While bilateral and multilateral agencies have been increasing their assistance to African countries in recent years, these efforts generally exclude scientific work. Few international assistance agencies support doctoral-level training or provide research project support to biomedical and social scientists from developing countries. USAID funds available for operations research usually go to U.S.-based cooperating agencies, with only small amounts trickling down to support local data gathering--usually on specific topics defined by the international funding agency. This lack of support of scientific training and research reflects a short-term perspective on the part of bilateral and multilateral funding agencies that overlooks the close relation between scientific work and government development efforts. Studies on the consequences of population growth for development or on social and economic welfare can enhance government motivation to undertake population programs; and studies on the determinants of fertility or on contraceptive technology can identify appropriate ways to proceed if a government wishes to introduce family planning.

Developing countries need increased numbers of social and biomedical scientists both to develop the data and analysis base and to participate in the development policy process. But there continues to be a dearth of both doctoral-level biomedical and social scientists and institutions within most African countries that could undertake this work. The development experience of other regions over the past three decades indicates that foreigners cannot be substituted for native-trained scientists. Policymakers more readily accept analyses of the implications of rapid population growth and recommendations for reducing that growth when they come from indigenous scholars. Yet, in Africa, very few countries have any social or biomedical scientists who can be drawn into development and population planning.

The lack of trained population scientists is only part of the problem, however. As important, and perhaps a more intractable problem, is the institutional environment within which research and training in the population sciences are carried out in Africa. Limited governmental resources make it difficult to support higher education at the levels of industrialized countries. Most university faculty members are coping with poor infrastructures for carrying out research (lack of laboratory equipment, computer problems, dearth of scientific literature), little or no domestic or external funding of research projects. Yet, they attempt to respond to requests from government agencies for data or research findings that generally cannot be provided because of the lack of appropriate data and studies.

In addition, even some of the well-trained Africans are not engaged in productive work. Many Africans trained abroad find positions in universities that have little or no demographic capacity and that lack a supportive environment. Others are absorbed into government statistical offices where they usually do work that could easily be performed by less trained personnel if the capacity existed in the country for middle level training. Some, of course, do not return home because of the lack of appropriate job opportunities. Similar problems would also apply to biomedical scientists, who face additional problems related to the lack of laboratory equipment and the difficulties of keeping abreast of technological and scientific developments. In a few countries of Subsaharan Africa, there is a growing number of young scholars who have recently completed their medical or doctoral studies abroad and who are eager to participate in research on reproductive health, fertility, and population dynamics. In most other countries in the region, few or no highly trained social or biomedical scientists can be identified.

In the light of these considerations, attention should be given to strengthening the ability of existing African scholars to carry out substantive and policy research; to identifying African scientists and scholars trained in other fields who have expertise that could be brought to bear on population issues.

Three specific activities or mechanisms should be considered: institution building and training; support of research projects; and networking, exchange, and dissemination.

1. Institution-building and Training

Long-term solutions and strategies in Africa will require the strengthening of university-based training and research programs. All but a few African countries have a dearth of biomedical and social scientists. Attention needs to be given to expanding high-level human resources and strengthening selected African universities. Inasmuch as research and training reinforce each other, institutions providing quality training will likely be institutions undertaking solid research on population.

Most African universities have been set up in the past 25 years and are relatively fragile institutions. Shortages of human, financial, and other resources constrain these universities as they are called upon to accommodate rapidly expanding student enrollment and to assist with the national development effort. Nigeria has the most extensive university system in Subsaharan Africa--23 universities--although the rapid expansion of this university system in the 1970s diluted considerably the quality of its premier university--the University of Ibadan. Nonetheless, Nigeria has the largest core of trained biomedical and social scientists in Africa.

In East Africa, Kenya, Tanzania, and Zimbabwe provide special opportunities. At the University of Nairobi, the University of Dar es Salaam, and the University of Zimbabwe, Harare, attention should be given to strengthening programs in demography and to the development of data and analyses on topics such as sociocultural barriers to acceptance of family planning, the effects of infant and child mortality on fertility, and the consequences of population growth - for the environment, the labor force, food supplies, and public-sector services. At the University of Nairobi's Center for Research in Human Reproduction, which is one of the strongest biomedical center in Subsaharan Africa, efforts should be made to support contraceptive introduction and safety studies.

2. Research Projects

Improved data and analysis are needed on most African population issues, but some topics require priority attention. Many African countries have just taken their first census; vital registration systems are incomplete and of dubious quality; and population surveys are only available for a few countries. At the same time, the data base is improving. Ten African countries, for example, participated in the World Fertility Survey and about twelve will likely participate in the Demographic and Health Surveys Project now in progress, under USAID contract. In recent years, USAID and the UNFPA have supported operations research in Africa. Operations research focuses on factors associated with adoption and continuation of family planning. The data gathered apply to clients of family planning clinics and, therefore, research findings cannot be generalized to the total population. As important as this work may be, it can not generate information on the socioeconomic or cultural determinants of fertility or mortality or on the physiological and health effects of contraceptives. Research support is needed for work in these areas, and for other scientific topics of interest to the scholar; such topics may have considerable policy and applied relevance over the long run.

3. Networking, Exchange, and Dissemination Activities

Most returning African scholars lack peers in their substantive fields and are cut off from international scientific networks, as well as from national policy discussions on population and development. The lack of a supportive environment reduces the productivity that should occur even in contexts where capacity is limited. Efforts are needed to link young scholars into national, regional, and, if appropriate, international scientific and policy networks.

There have been relatively few, if any, opportunities for Africans to present and exchange research findings and learn from the experience of colleagues and peers in other African countries. Scholars are seldom included in meetings that are oriented toward government policymakers and program managers. Scientific meetings on contraceptive technology or determinants and consequences of fertility are not held with any regularity. This contrasts sharply with Latin America and Asia where regional associations and other organizations have promoted many scientific exchanges over the years.

Mr. Chairman, by strengthening Africa's indigenous base of institutions, knowledge and knowledgable people, a major contribution could be made toward the adoption and implementation of appropriate population policies.

Mr. SCHEUER. Thank you very much, Dr. Segal.

All right. We'll go on the 10-minute rule now, Madam Schneider.

Miss SCHNEIDER. I won't know what to do with all that time.

I think my frustration comes in my desire for some specifics, so I will address my question to all four of you, and whomever would like to respond, it would be terrific. I certainly agree with you, Dr. Segal, with your two recommendations, and insofar as having available the solutions or the technology or whatever, terrific, but where I am looking for answers is in the distribution end of things, and I would like to hear a few examples of where we have seen good distribution systems, and why have those examples not gotten more attention and why have they not been picked up by other nations? So let's just start there.

Ms. HARRIS. I think part of what I was saying is that we don't have a lot of examples but where we have them, Zimbabwe possibly is the best example of a nationwide program which has been fairly successful. I think we have very poor progress in the commercial sector, and part of that is due to the policy side that governments have to be encouraged to promote. That is the best distribution system in Africa. Any village, you can get a Coca Cola, and if we can encourage distribution of contraceptives through more commercial means and less restrictions on the contraceptives coming in, less duty, we could probably—you know, those distribution networks we could use right away. I think there are inadequate numbers of contraceptives in most countries in Africa.

Miss **Schneider**. Well, let me ask this: I know that, for example, in Kenya there is Dole Pineapple, Firestone.

Ms. **Harris**. Yes.

Miss **Schneider**. Dr. Segal, who works with a private foundation, and I'm sure many of the rest of you deal with various corporations who may be located in some of these African nations, has there been an effort for distribution through these factories?

Ms. **Harris**. I think during your visit in Kenya it was unfortunate that, for I don't know what reason, the visit to the family planning clinic at Dole Pineapple—I mean, that was the original reason for the visit and it was cut out at the last minute. Actually, those companies participate in a private enterprise family planning program which is one of the first of its kind in Kenya.

Miss **Schneider**. And obviously it's not successful, given the whole rate, as yet.

Ms. **Harris**. It's only a year old, and I think that it has been successful in that it has gotten a tremendously positive response from the people in the companies.

Miss **Schneider**. Now is that kind of effort taking place in other parts of Africa, beyond Kenya?

Ms. **Harris**. It's starting up, and in fact that's just—the project that I will be working with is promoting private enterprise kinds of activities.

Miss **Schneider**. OK. Thank you.

Dr. **Speidel**. If I could just comment, I think one reason we have seen so little success in Africa is, the level of effort has been so small compared to the need.

Miss **Schneider**. Right.

Dr. **Speidel**. With the U.S. AID putting $35 to $40 million or 10 cents per capita into sub-Saharan Africa, it's not surprising we don't see a lot, when it takes about $2 per capita to run a reasonable family planning program. When one looks at the nature of the service delivery system out where the people live—as it was pointed out, this is still not an urbanized continent—it is extremely weak. What little clinical services are there are overwhelmed by the daily need for health care, so——

Miss **Schneider**. I realize it's weak, but what I want are the answers of what we can to to make it stronger.

Dr. **Speidel**. Well, I think we can do what has worked in other settings. We can provide the funds, the technical assistance, the know-how, the training, and the contraceptive commodities. I think the policy, although still not far enough along, is strong enough that it will work now. Sure, there are pro-natalist conditions in that society but there is a very large unmet demand for family planning.

For example, if you look at Nairobi, indeed it's the most modernized part of Kenya, but some 40 percent of potential clients are actually using contraceptive services in that area because they are available. That's the only place in Kenya where there is a good delivery system.

Miss **Schneider**. Might I mention that it seems to me that there are a number of perhaps innovative approaches that could be taken, you know, beyond using the commercial sector. It seems to me that the possibility of using the radio network—I understand that, granted not every individual or family has a Walkman but I do know that radio is one of the key ways of communication. Because of the illiteracy, this could be a very positive way of communicating the beneficial aspects of family planning. Are there any examples of that sort of thing going on? Yes?

Mrs. OFOSU-AMAAH. I would like to say that when we look at the population problem and we talk about family——

Miss SCHNEIDER. I don't think your mike is on. Is it on?

Mrs. OFOSU-AMAAH. Yes.

Miss SCHNEIDER. Sorry.

Mrs. OFOSU-AMAAH. I would say that when we talk about family planning and we discuss the population issue in Africa, the people that we have in mind really are the rural people because this is where the problem is. Now using commercial outlets for the distribution of contraceptives may be one of the ways of distributing contraceptives in the rural areas, but we shouldn't forget that these outlets might be very limited in their distribution. Using the radio is another way, but the same problem that we have with the commercial outlets, we might have with the radio.

In a project that was funded with United States AID support in Ghana, for instance, they went to the extent of using volunteers, selecting people in the community, training these people, and using them to distribute contraceptives. The volunteers may be what we call traditional birth attendants who are the—the midwives are called in the community. They don't have any training, but through the project they were given some training to improve on their practices and they were also used as family planning agents within the community. This I think was found quite successful because acceptance rates increased considerably in those communities where the project was implemented, so I think there might be other innovative ways of distributing contraceptives and trying to reach those people, the rural people, who have not so far been reached by many programs.

Thank you.

Dr. SEGAL. Mr. Chairman, I would like to address Miss Schneider's question in a broader scale. I think it is a key question: What are specific examples of success? If we can use this high technology here and get it to work, I'll show you just one slide.

Mr. SCHEUER. By all means. Let's douse the lights. OK?

Dr. SEGAL. An example of how difficult it is to transfer technology is demonstrated by the fact that in the U.S. House Committee on Science and Technology, we have a difficult time getting the slide projector to work, but essentially what the slide shows—and I could present it to you for the record—it is an illustration of how rapidly——

Mr. SCHEUER. Why don't you pick up your mike?

Dr. SEGAL [continuing]. It's an illustration of how rapidly change can occur in countries that really 10 years ago were in similar situations, examples of countries with 80 percent rural populations such as Thailand, Indonesia, Colombia. You go from the percentage of couples using some form of contraception down in the range that we are hearing about today in Africa—10 percent to, say, 20 percent—up to 50, 60, or 70 percent even, as is now being experienced in some areas of Thailand, including rural areas. So if we get out of the way of those efforts to really introduce programs, if we let those efforts go ahead, change can occur in a very rapid time, and I don't think we need to invent completely new modalities. There is a lot of experience that has to be applied.

Mr. **Scheuer**. Is there any country in sub-Saharan Africa that has more than 10 percent usage of family planning by its women of childbearing years?

Ms. **Harris**. Zimbabwe, the Bank's statistics are that they may have as high as 35 percent prevalence in urban areas and about 20 percent in rural areas, but higher than that in rural program areas where they have these community distributors, you know, community-based nonmedical distributors of family planning methods.

Mr. **Scheuer**. Mrs. Ofosu-Amaah?

Mrs. **Ofosu-Amaah**. No, I think I was also—sorry—I was also thinking of Zimbabwe. The project we had in Ghana was a pilot project which was implemented in a specific area in a specific area in the country, so one cannot generalize.

Mr. **Scheuer**. That's all right. We'll extend your time. Yes, Joe?

Dr. **Speidel**. I was going to say, of 11 countries surveyed 2 had 10 percent or higher, though I can't name the two, to tell you the truth, but of the 11 that the World Fertility Survey or the Contraceptive Prevalent Survey looked at, there were two that had 10 percent or higher prevalence of use, but that's still barely on the board.

Mr. **Scheuer**. Kenya and Nigeria, I take it, have lower than 10 percent.

Dr. **Segal**. Very low, yes, around the 10-percent level.

Mr. **Scheuer**. Are you finished?

Miss. **Schneider**. Yes.

Mr. **Scheuer**. Dr. Speidel, I don't want the hearing record to show that the panel placed the blame for sub-Saharan Africa's rather painfully low rate of contraceptive use on the low level or the inadequate level of U.S. contributions. I would fight for a higher level of U.S. contributions, too, but there is money available in the World Bank and these governments are not—these chiefs of state, their health ministers, their development ministers, their planning ministers—are not applying for it. They are not producing applications, and it seems to me that in addition simply to providing funding, we have to convince them, handhold them, show them how to produce applications and to produce their own programs.

Until they develop the will to make the necessary changes in their society, not only to open up programs but to have the kind of sea change in attitude that Marshall Green talked about, I don't think we are going to make great progress. I really don't think that the developed world can be given sole blame for the current pitiful condition of family planning programs in Africa. I think the developing world has to understand that over the long pull the help that is going to come from the developed world is going to be more or less at the margins; that the leadership and the initiatives and the drive and the financing is going to have to be internally generated. We stand ready to give them all kinds of technical aid and we should give them financing aid, but basically both the leadership and the administration and the funding over the long pull is going to have to come from within. It seems to me to be our challenge to generate all of those things.

Yes?

Dr. **Speidel**. I quite agree there is blame enough to go around on every side here, but I think we should focus on the U.S. role because that's what the Congress can do something about.

Mr. **Scheuer**. Quite correct. Of course that's the purpose of these hearings.

Dr. **Speidel**. Right, so when you have the paradox of AID saying, "Well, we can't establish a position for a population officer because there is no demand for a family planning program," on the other hand there will be no one there to help, to sit and work with the Government onsite, to try to help them think through the implications of population growth to their own development situation, so we have a chicken-egg situation. We have got to be much more aggressive, I think, in terms of trying to help Africa. What we are seeing today, though, is a dismantling of the population program, piece-by-piece, by bad policies and threatened budget cuts.

Mr. **Scheuer**. I agree with you on all counts.

Congresswoman Schneider.

Miss **Schneider**. And I do, too. However, being the guardian of the taxpayers' dollars which I am, and you are coming to me and you are saying you want more money, which is what we always hear when we sit here and someone else sits at that table, but our responsibility is to ask the question, "What are you going to do with that money once you have it?" I'm afraid that I'm not fired up enough to go and fight for the money that you're asking for because I don't feel that—I feel that the problem is there and the need to solve it is great but I also am resistant to throw dollars at a problem. I want to throw dollars at a solution, and I haven't heard enough specifics to persuade me that you have a game plan in mind, that there is a strategy.

I think that, you know, I am just sitting here intemittently fantasizing about how, if a foundation—and I used to work with a lot of them prior to coming here—or some different academic centers were to get together, like Columbia University or others, and you had all the brainpower together to say, "Here is the problem; we need a solution," and you brought in a fancy New York PR agent who was asked to contribute free of charge his assistance in helping Firestone Tire or Dole Pineapple or whomever or whatever, it seems to me with all the different nongovernmental organizations that are focusing on this problem, it ought to be possible to come together and to say, "Let's really come out of this effort with a cohesive game plan."

Dr. **Segal**. I'm told that they can show the slides and——

Mr. **Scheuer**. Very good. Let's go.

Dr. **Segal** [continuing]. I'm still addressing these slides to your question, Miss Schneider, so if you will permit me I'll run through them quickly. At least they tell me that they can.

Mr. **Scheuer**. Do so.

Dr. **Segal**. It's a little smaller than I would like. Perhaps you can see that. That's a picture of contraceptive prevalence in a typical developed country

Mr. **Scheuer**. Can we focus that?

Dr. SEGAL. That pie chart assumes the total population in the reproductive age group is 100 percent. The colored areas show use of various kinds of contraception and the white area, the unfilled part, is those couples who are for one reason or another in the United States not using some form of contraception. That's about 30 percent. It will be the same in the United Kingdom, any western European countries. They are trying to get pregnant or have just been pregnant or some reason like that, so 70 percent is roughly the contraceptive prevalence in a developed situation where you have low birth rates, partly as a consequence of this.

Next slide. In developing countries it is the reverse. The white area is the nonuse. It's roughly 70 percent nonuse and 30 percent or approximately 30 percent—this includes China, so the rates go up a little higher—about 30 percent typically of use and 70 percent nonuse. Africa, among all the developing regions, is the worst of all.

Next slide. I noticed when I brought my slides I didn't get an African country in my box, but it's typically the same as you see here for one of the African states, roughly 90 percent nonuse, and the kind of methods that are being used in these countries are typically those adopted by people after they have had high fertility. You see these are mainly tubal ligation or vasectomy slices of the pie in red there. Now in a situation like that you can expect birth rates in the 1940's to 1950's, and until we change that distribution of the pie, we are going to have those kinds of high birth rates.

Mr. SCHEUER. When you say you expect birth rates in the 1940's and the 1950's, what does that mean?

Dr. SEGAL. With that low level—well, it depends of course what the death rate is, but that's what you get then for countries that have natural rates of increase of 3 to 4, as you find in Africa.

Mr. SCHEUER. Yes.

Dr. SEGAL. So the question you are asking is: Do we have a game plan to get from this pattern to the pattern we saw?

Next slide. Well, here is an example of what happened in a relatively short period of time, between 1960 and 1970, roughly, on an average. The kind of thing on the left is what prevailed in Thailand, typical of what you see in Africa today, and just 10 years later getting very close to as good a usage picture as one can expect to get, and that was done through all the things you talked about. If you have been to Thailand—I know the chairman has—there are these incredibly imaginative programs to use the private sector, to use radio, to distribute condoms through every means that you can imagine. There is—examples of what works in a general sense are there.

There are also some very important local conditions, as my colleague has pointed out, that have to be taken into account, that require social science evaluation. What is it that is going to be important in the specific local situation in Africa, to add to what we have already learned from experience elsewhere in the world, that will bring about this transition in a relatively short period of time. It can be done in a relatively short period of time. The conditions are ripe in Africa now if we get out of the way. It's not just a matter of whether we help or not, but if we create barriers to success that's even worse than not helping, and I'm afraid we are starting to do that, given some of the policies that we have heard about today.

Next slide. Thailand is not the only example, of course. There are several in different parts—this is a repeat of the Thailand. Next slide. There are other examples. I see we keep coming back to Thailand for one reason or another. Is there another one? I'm sorry. I had other examples of Colombia and Indonesia, and in both cases it's essentially the same thing, so I guess what I'm saying is, please don't ask us to give you a specific recipe for success in country after country. It's not possible.

Miss SCHNEIDER. That would be very shortsighted and a stupid question on my part. If that's how it came across, it was not intended, but no, I am very attuned to the need for culturally retrofitting each program, but it seemed to me that there ought to be one generic model that might have a series of general ideas that could be specifically applied to countries with some alterations here and there.

Dr. SEGAL. I think we have, and I just hope I can leave you with the sense of optimism that I have, that if we give it a chance it will work.

Miss SCHNEIDER. Let me just quickly ask, are there any specific barriers that could be overcome by legislation?

Mr. SCHEUER. By us, you mean?

Miss SCHNEIDER. Yes.

Dr. SEGAL. Well, in terms of what we as a country do, I think there are. Of course, there are no specific barriers that we can legislate that will impact on policies within the individual countries, but the legislative impact on American policy is of course terribly important. I think this Congress has been remarkably farsighted in the emphasis it has given in the Foreign Assistance Act to providing funds to the Population Office of U.S. AID.

There are some adjustments that should be made. In my opinion, I think that the constraint upon funding the World Health Organization's program in human reproduction is inexplicable to me. It's a very valuable program. It plays a very important role in the overall scene. That could be an effective legislative action. I think that just seeing to it that the intent of Congress is fulfilled by the way the State Department, through AID, implements its population program would be a very valuable contribution.

Miss SCHNEIDER. Good, and you have just given a very valuable contribution. Thank you.

Mr. SCHEUER. Well, the whole panel has given us a very valuable contribution. We are sorry we are operating under such a time limitation but we must adjourn this panel now. We are grateful to you all for your very excellent testimony. We have a whole host of questions that we will put in the mail to you, and we will hold the record open for 10 or 12 days to give you time to answer them at your convenience. Thank you very, very much. We are grateful to you for your excellent testimony.

The meeting is adjourned.

[Whereupon, at 12:10 p.m., the subcommittee recessed, to reconvene at the call of the Chair.]

AFRICA AND HUNGER: PROSPECTS FOR SUSTAINABLE DEVELOPMENT IN SUB-SAHARAN AFRICA

WEDNESDAY, OCTOBER 23, 1985

House of Representatives, Committee on Science and Technology, Subcommittee on Natural Resources, Agriculture Research and Environment,

Washington, DC.

The subcommittee met, pursuant to call, at 9:45 a.m., in room 2318, Rayburn House Office Building, Hon. Tim Valentine presiding.

Mr. Valentine. The Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

Chairman Scheuer has been called out of town this morning and has asked me to chair today's hearing.

Today, the subcommittee holds its third in a series of hearings on famine in sub-Saharan Africa and the prospects of sustainable long-term development. In previous hearings we examined the role of climate and population and how it bears on the food problem in this part of the world. Today and next week the subcommittee will take a detailed look at the impact of environmental degradation in that part—and that part of Africa's ability to feed itself.

Twenty years ago Africa was self-sufficient in producing food to feed its people. Now it imports 20 percent of its cereal requirements. It is the only developing region in the world suffering from a decline in the level of nutrition. While Africa's food crisis is not usually thought of as an environmental problem, a growing body of evidence suggests that widespread erosion, deforestation and desertification are but visible signs of a severely stressed ecosystem, one that is primed for dramatic failure during periods of reduced rainfall.

Restoring the resilience and fertility of Africa's soils and forests may be the first and most significant step that we can take toward helping Africa develop a sustainable food production system. New understanding of traditional native agriculture is teaching modern scientists that soils and nutrients can be preserved by sustainable agriculture practices.

While Africa's climate is harsh, appropriate technologies which take into account the economic, cultural and ecological constraints faced by Africa's small farmers appear to offer real hope for reversing Africa's environmental decline. Over the next 2 days the subcommittee will learn more about the innovative ways in which modern technology is applying ancient principles of conservation to boost food production and protect natural resources.

Before we turn to our distinguished witnesses this morning, I would like to recognize the ranking Republican member of the subcommittee. A very useful, distinguished, able, and lovely Member of the Congress, Representative Claudine Schneider of Rhode Island, who has provided especially and particularly in this area real leadership.

Congresswoman.

Miss **Schneider**. Thank you, Mr. Chairman. I appreciate that illustrious introduction. And I am delighted that we have the opportunity today to hold these hearings. I will say that this is one in a series of hearings that will review some difficulties and the short range and the long range problems with famine in Africa. Today's hearing in particular will focus on some of the appropriate technologies that will be useful to help Africa plan for the development of a much more effective agricultural food policy that would meet the needs of its growing population.

And I think it is rather alarming to recognize that during the third quarter of this century world food production has surged ahead, outstripping population growth, holding out the hope that hunger could be effectively banished. Over the last decade, however, growth in production has slowed dramatically raising doubts about long-term food prospects. And in particular, the food situation in Africa has deteriorated dramatically. One percent annual decline in per capita grain output since 1968 has been severely aggravated by the drought of 1983 and 1984. It's been further aggravated by a significant decline in per capita income of over 20 percent of the past decade.

So there are great rays of hope. I think that various new technologies provide methods to—that we can be developing in order to help raise the productivity of African resources for food production. The mixed garden technology about which we will be hearing later could be a key agricultural approach for helping to ameliorate some of the hunger problems and also to prevent famine and to ensure that nutrition and economic security for individuals and for families and villages are guaranteed throughout all of Africa.

I really believe that our country has a direct and growing interest in the environmental and natural resource problems of the developing world, and in particular in Africa. Humanitarian and environmental values are at stake, but so are the U.S. economic and natural security interests. I think there is very little question that we need to examine some of the more attractive ways to help feed the victims of the African famine, and certainly new technologies can play a key role in helping to meet this particular need.

Emergency food aid, while essential, will actually do nothing to address the long range development needs of many African nations. And so without the assistance of a long range policy, we'll be putting at risk hundreds of billions of dollars owed to the U.S. Government and commercial banks by these developing countries. In order to help us meet these different challenges, I was recently appointed to serve on a blue ribbon task force to help develop a series of recommendations for congressional action, and this would promote worldwide, long-term environmentally sustainable growth.

The panel spent a great deal of time examining some of the various pieces of legislation, government aid policies, and we developed recommendations to better harness our existing precious natural resources. I'm extremely pleased that we are honored today to have as our first witness Mr. Gus Speth, who has served as the chairman of this task force and who is currently the president of the World Resources Institute. And I can assure you that the insight that he will share with us this morning will be basic enough upon which we will be able to make many of our proposals.

I'm also extremely pleased and honored that we have the opportunity to introduce a wide range of distinguished witnesses. Our second panel will include Mr. Ed Asner, Richard Dreyfus, Dr. Paul Winchell, and Dr. Henry Heimlich of Africa Tomorrow, who will help us examine some of the very appropriate technologies in the role of meeting African hunger needs. I think it's very gratifying that these gentlemen should take their busy schedules and make it possible for them to come here to discuss this significant world crisis with us. And I believe that their participation testifies to the importance of the task that this subcommittee is facing today.

We also have a number of other distinguished witnesses who will talk to us about a variety of environmental factors and promising new technologies to help Africa solve this food crisis.

And we have before us a very lengthy schedule, so I'm looking forward to it being a most productive hearing. I will not go on any further, Mr. Chairman, but I thank you for convening this hearing today, and I would like to welcome all of our distinguished witnesses and look forward to the insights that you are about to provide us with.

Thank you.

Mr. **Valentine**. Thank you very much.

The first witness, as has been stated, is Dr. James Gustave Speth, who is an outstanding American. He served as Chairman of the Council on Environmental Quality under President Carter, and he's currently president of the World Resources Institute. He has chaired a blue ribbon panel established by the Environmental and Energy Study Institute on sustainable development in the Third World. And he is very much in the news, and will give more details, I believe, on this report of an international task force convened by the World Resources Institute of which he is president, having to do with "The Tropical Forests: A Call for Action." Those of you who have read the newspapers in the past several days or turned on your radio or television have heard something about this report, and I hope that we will hear more about it from the good doctor.

We are happy to have you here, Doctor. If you would like to summarize your report, your—what you have filed will become a part of the record. But you proceed in any way you deem appropriate.

STATEMENT OF JAMES GUSTAVE SPETH, PH.D., PRESIDENT, WORLD RESOURCES INSTITUTE

Dr. **Speth**. Thank you very much, Mr. Chairman, and Congresswoman Schneider. It's a great pleasure for me to be here with you this morning.

Let me begin by commending you for holding these timely hearings to examine the prospects for sustainable agricultural development in Africa. I have with me Dr. Mohamed El-Ashry, a senior associate at the World Resources Institute, who will certainly help me considerably if you have any questions.

I will summarize my statement and submit the entire statement for the record.

As the attachment to your memo on these hearings states, few events have captured the attention of the world community as the current famine in Africa has. While the dimensions of this tragedy are staggering, and relief efforts will undoubtedly save many lives, it is important to focus on the future and the need to reverse current trends. For only if we deal with present problems effectively and then address in a more preventive way and remedial way the problems that have led in large part to the present problems—crisis—will we prevent the recurrence of the type of famine that we're having now, and indeed had 10 years ago.

Many factors are responsible for Africa's failing food production. The drought is only partly to blame. Droughts have occurred regularly in sub-Saharan Africa for the last 2,500 years. The effects of the current drought have been made much worse by overexploitation and mismanagement of the continent's fragile resource base. Growing human and livestock populations and inappropriate development policies have degraded forest and the soil and water resources, and magnified the drought's destruction.

Indigenous African cultures long ago developed production systems which were well adapted to the limits imposed by the fragile and arid conditions in Africa. Many new development schemes, on the other hand, have not fit into production systems based on local rainfall and soil types. As a result these new programs have been less productive than traditional systems. And as a consequence of these schemes, as indicated in a recent World Bank study, some success has been achieved but the overall results have been more destructive than constructive.

Traditional systems, of course, have their own limits. In recent years, those limits have been exceeded due to rapid human and animal population growth, by changing social, political and economic policies, and by inappropriate Western-style development schemes.

One problem is the overreliance on cash crops to the extent of local food production. This has increased soil erosion and decreased soil productivity. Cash crops such as cotton and peanuts consume large amounts of nutrients and reduce soil fertility. The thin topsoil, which is left bare between growing seasons, is particularly susceptible to erosion and compaction. With large areas of good soils used for cash crops, farmers are forced to cultivate increasingly marginal lands. They overcultivate these lands and shorten the fallow periods in order to meet increased food needs and population expansion, and the soil continues to degrade.

At the same time, pastoralists are pushed off their traditional grazing lands and end up overgrazing the limited and more fragile rangelands available to them. While pasture size has decreased, herd size has grown due to better veterinary care.

Land degradation and desertification is not caused only by poor agricultural and grazing practices. Devegetation of the land for fuelwood and for charcoal production is degrading millions of acres of Africa's watersheds, causing severe soil erosion and disrupting the delicate water balance. An estimated 1.3 million hectares of forests are being lost in Africa every year, 55 percent of which is in West Africa. The exploitation of woodland resources around towns creates rings of severe desertification extending 40 to 50 kilometers around many urban centers.

An arid and fragile ecosystem exploited beyond its carrying capacity eventually breaks down, and, whether in the U.S. Dust Bowl or Africa, the results are tragic. Fuelwood gathering; overgrazing; expanding agriculture that is rainfed, not irrigated; and other practices have combined to degrade severely many watersheds and to accelerate soil erosion. Figures for soil erosion as high as 450 tons per hectare per year are not unusual, and in Ethiopia's Highlands 1 billion tons of valuable soil are being stripped by erosion every year. One billion tons. In all, about 7 million square miles are threatened by desertification in sub-Saharan Africa, and 16 percent of Africa's rainfed cropland will be lost by the end of this century if conservation efforts are not taken now.

Present laws and practices related to land ownership, to credit, and to extension services mostly exclude women from access to loans and education, although women are an essential part of farming and food production in sub-Saharan Africa. In many African cultures women have traditionally played a role in trade as well as shared ownership of the land. However, the introduction of European legal systems has encouraged single ownership by men.

Land degradation, soil erosion, and water depletion have been the result of extreme climatic events, overuse of resources, ill-suited development policies, and high population growth. All of these have combined to threaten the future prospects for food production in Africa. We must consider long-term actions and investments now to reverse these recent trends. Unless we act now, I can assure you that this country will be called upon to pay a much higher price later.

In that regard, a task force of the Energy and Environment Study Institute, which I chaired and which Congresswoman Schneider was an outstanding member of, recently released its report. It called for environmentally sound agricultural development policies and projects which increase food production while at the same time helping to restore the continent's fragile natural resource base. It said that this can be done by redirecting and better harnessing existing U.S. programs and by bolstering private sector initiatives in African countries.

The panel, Mr. Chairman, was composed of a cross section of American business leaders, scientists, environmental leaders, people involved with development such as CARE and other organizations.

The first recommendation made by the panel was to call upon the Congress to enact the legislation introduced by Congressman Gilman, H.R. 2782. This legislation, as you know, addresses these long-term African resource needs.

In addressing strategies for future increased food production in sub-Sahara Africa, we at the World Resources Institute believe that the highest priority must be given to methods, technologies, and practices that would contribute to increased production of food from traditional farming systems. We believe that such emphasis would best help the resource poor and neglected rural areas where help is so desperately needed. Also, by increasing productivity of food crops on existing good lands, the pressure to farm more marginal lands could be reduced.

In our view, an overall strategy must involve the development and transfer of appropriate technology for increased food production while conserving soil and water resources. These tasks are not impossible. We don't have to reinvent the wheel. Nor should we try to replicate in Africa the wheel that we invented in the rich countries of the North.

Africa has a reliable labor force, if only it can be used. Successful schemes for grazing management, for small-scale irrigation, for village-level water harvesting, soil conservation, watershed rehabilitation, fuelwood development and agroforestry already exist and merely await application on a broader scale.

For example, there is a growing conviction among specialists in low-cost irrigation that the use of buried, porous earthen pots could significantly increase crop production from small- and medium-scale cultivation in arid lands.

Water harvesting, another old idea which can almost be regarded as rainfed irrigation, has found its way into the area of Lake Baringo in Kenya. Water harvesting techniques capture the runoff from high intensity rainstorms and direct it to water trees and crops in the field.

An alternative to large and costly dams and reservoirs, and their associated environmental and health impacts, are subterranean dams, structures designed to retain rainwater in shallow strata of the soil. These are particularly appropriate in arid and semi-arid regions.

Conservation tillage methods, which increase the amount of moisture stored in the soil and reduce soil erosion, have been used successfully in Ghana where they have increased grain production yields and reduced runoff by 70 to 90 percent.

Animal power is not well used in farming or in water pumping in sub-Sahara Africa. It's estimated by the U.N. Environment Programme that if 1 in 3 of the region's 200 million domestic animals were put to work for 4 hours a day, about 13 million horsepower per year could be generated to boost food production.

We also need to improve information on the resource base, basic information on available resources in the region, and to assist in developing local African capabilities for developing information on conditions and trends. The importance of studying the Earth as a system and of studying the African environment as a system cannot be overemphasized.

Mr. VALENTINE. Doctor, I hate to interrupt you, but we are—the bells have tolled, and we're going to have to go for a vote. And I wonder could you, so we could get into questions when we come back——

Dr. SPETH. Yes.

Mr. **Valentine**. Could you summarize the rest of your statement in a few minutes? And I think we have about 5 minutes before we have to go to the floor.

Dr. **Speth**. Before you have to go. Yes, sir.

Mr. Chairman, the report of the Environmental and Energy Study Institute contains 13 recommendations which our task force has made to the Congress. We believe that each of these recommendations could have a dramatic effect in promoting sustainable food production and sustainable development in Africa. They're general recommendations. They apply across the board to all developing countries, but we need a spearhead in the Congress to promote these recommendations. All of them taken together could have a dramatic effect on improving the capability of resource management people in Africa and agricultural people in Africa to manage their own food production and their own resources.

We can't control the situation there, but we can certainly influence it through the 13 recommendations made by this Environmental and Energy Study Institute Panel. I would like to submit the panel report for the record, and I would also like to call your attention, as you did earlier, Mr. Chairman, to the report that the World Bank, the U.N. Development Programme, and the World Resources Institute has done on the need for increased fuelwood production and increased forestry controls and forestry production in Africa, so that the fragile soil base in areas such as the Ethiopian Highlands can be stabilized. In the continent of Africa and elsewhere in the tropics, there is no distinction between agriculture and forestry. There is no distinction between energy and forestry and agriculture. These things are all linked. Too often in the past, our development policies have not taken those linkages into account.

So I think this committee could do a great service if it paid close attention and study to the recommendations of the Environmental and Energy Study Institute Panel and to the recommendations of the World Bank, U.N. Development Programme, World Resources Institute forestry management and conservation program.

Thank you very much.

[The prepared statement of Dr. Speth follows:]

STATEMENT OF GUS SPETH

PRESIDENT, WORLD RESOURCES INSTITUTE

BEFORE THE U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE AND TECHNOLOGY,

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE

RESEARCH AND ENVIRONMENT; HEARING ON

"HUNGER IN AFRICA: PROSPECTS FOR SUSTAINABLE DEVELOPMENT,"

Washington, D.C.
October 23, 1985

Mr. Chairman and distinguished members of the Subcommittee. Thank you for inviting me to testify on the important subject of food production and hunger in Africa, and on the relationship between agricultural practices and environmental degradation in the sub-Saharan region.

Let me begin by commending you for holding these timely hearings to examine the prospects for sustainable agricultural development in Africa. As the attachment to your letter correctly states, few events have captured the attention of the world community as has the current famine in Africa. However, while the dimensions of the tragedy are staggering, and relief efforts will undoubtedly save many lives, it is important to focus on the future and the need to reverse recent trends. For, if we only deal with present problems, the future's problems could be even worse.

Over the last two decades, Africa's per capita food production has been constantly falling. Food production has increased at 1.5% per year in the 1970s, but at only 1% in the 1980s--the lowest rate of increase anywhere in the world. At the same time, annual growth in African population is the highest in the world today; about 3.1%, up from 2.5% in the 1960s and 2.8% in the 1970s.

Many factors are responsible for Africa's failing food production; droughts are only partly to blame. Droughts have occurred regularly in sub-Saharan Africa for the last 2,500 years. The effects of the current drought has been made much worse by over-exploitation and mismanagement of a fragile resource base. Growing human and livestock populations and inappropriate development policies have degraded forest, soil, and water resources, magnifying the drought's destruction.

Africa's ability to increase food production, and to avoid future famines, depends on the rehabilitation and improved management of degraded natural resources. The problems of sub-Saharan Africa can be described in terms of the "carrying capacity" of the region and the use and overuse of its fragile resource base. Over two-thirds of the land area of the continent is arid or semi-arid; rainfall is slight and very variable. Soils are thin, have low fertility, and are easily eroded and compacted. Groundwater reserves are limited, and the drought has lowered the water table temporarily. Even more serious is the removal of trees and other vegetative cover, which has suppressed the water table permanently.

Indigenous cultures long ago developed production systems which were well adapted to the limits imposed by these fragile and arid conditions. Many new development schemes, on the other hand, have not fit into production systems based on local rainfall and soil types. As a result they have been less productive than traditional systems. The consequences of these schemes, a recent World Bank analysis states, is that while some success has been achieved, overall results have been more destructive than constructive.

Traditional systems, of course, have their own limits. In recent years, those limits have been exceeded due to rapid human and animal population growth.

Let me be specific.

Traditionally, farmers cultivated drought resistant grains, grew trees to protect exposed soils from erosion, and practiced inter-cropping of trees with crops to minimize the impact of climatic fluctuations. They left their fields fallow for 10 years or more in order to restore soil fertility, and stored food and seeds for several years. In addition, certain traditional production systems matched farming practices to livestock production -- feeding livestock on crop residues and tree fodder, while using the animals' natural fertilizer for fields and gardens.

Unfortunately, these traditional production systems have been increasingly disrupted -- and destroyed -- by population growth; changing social, political and economic policies; and inappropriate, Western-style development schemes. Consequently, development projects have done little to restore the traditional production systems' equilibrium with the environment. Schemes intended to enrich an already fragile ecosystem have often served to make it poorer.

Reliance on cash crops actually increased soil erosion and decreased soil productivity. Cash crops, such as cotton and peanuts, consume large amounts of nutrients and reduce soil fertility. The thin topsoil, which is left bare between growing seasons, is particularly susceptible to erosion and compaction. With large areas of good soils used for cash crops, farmers are forced to cultivate increasingly marginal and vulnerable lands. Farmers overcultivate these marginal lands and shorten the fallow period in order to meet the increasing demand for food caused by population growth.

At the same time, pastoralists are pushed off their traditional grazing land and end up overgrazing the limited and more fragile rangeland available to them. While pasture size has decreased, herd sizes have grown due to better veterinary care. For example, in Kordofan province in Sudan, the number of cattle quadrupled in 20 years -- from 600,000 in 1957 to 2.4 million in 1977. Increased herd size, and decreased pasture land and forage, have disrupted traditional range management practices. To survive, and to save their animals, herders must overgraze the limited rangelands, degrading land for 10-12 kilometers around the villages and watering holes.

Land degradation and desertification is not caused only by poor agricultural and grazing practices. De-vegetation of the land for fuelwood and charcoal production is degrading millions of acres of Africa's watersheds, causing severe soil erosion, and disrupting the delicate water balance. An estimated 1.3 million hectares of forests are being lost in Africa every year, 55% of which is in West Africa. The exploitation of woodland resources around towns creates rings of severe desertification extending 40-50 kilometers around many urban centers.

An arid and fragile ecosystem exploited beyond its carrying capacity eventually breaks down, and, whether in the U.S. dust bowl or Africa, the results are tragic. Fuelwood gathering, overgrazing, expanding agriculture that is rainfed not irrigated, and other practices have combined to degrade severely many watersheds and to accelerate soil erosion. Figures for soil erosion as high as 450 tons per hectare per year are not unusual, and in Ethiopia's Highlands one billion tons of valuable soil are being stripped by erosion every year. In all, 6.9 million square miles are threatened by desertification in sub-Saharan Africa and 16.5 percent of Africa's rainfed cropland will be lost by the end of the century if conservation efforts are not taken.

Present laws and practices related to land ownership, credit, and extension services mostly exclude women from access to loans and education, although women are an essential part of farming and food production in sub-Saharan Africa. In many African cultures women have traditionally played a major role in trade as well and shared ownership of the land. However, the introduction of European legal systems has encouraged single ownership by men. Moreover, recent migration by men seeking employment in urban centers has placed even more responsibility on women to sustain their families' food needs, and environmental degradation has further increased their workload. Denuded landscapes and scarce water supplies mean vast distances must be covered and long hours spent gathering firewood and water.

Land degradation, soil erosion, and water depletion which have resulted from extreme climatic events, overuse of resources, ill-suited development policies, and high population growth all threaten to undermine future efforts at increasing food production in Africa. We must consider long-term actions and investments now to reverse recent trends.

In that regard, a task force of the Energy and Environment Study Institute (EESI), which I chair, has early this month called upon Congress to "emphasize environmentally sound agricultural development policies and projects which will increase food production while helping to restore the continent's fragile natural resource base. This can be done in part by redirecting and better harnessing existing U.S. programs and by bolstering the private sector within affected African countries."

As you are aware, on June 18, 1985, Congressman Gillman, who is a member of the EESI task force, introduced legislation (H.R. 2782) to address these long-term environmental and natural resource needs in sub-Saharan Africa, and the EESI panel believes Congress should enact this legislation promptly.

In addressing strategies for future increased food production in sub-Saharan Africa, we at the World Resources Institute believe that a high priority must be given to methods, technologies, and practices that would contribute to increased productivity from traditional farming systems. We believe that such emphasis would best help the resource-poor and neglected rural areas where such help is desperately needed. Also, by increasing productivity of food crops on existing good lands, the pressure to farm more marginal land could be reduced.

In our view, an overall strategy must involve the development and transfer of appropriate technology for increasing food production while conserving soil and water resources. These tasks are not impossible; and we need not reinvent the wheel. Nor should we try to replicate in Africa a type of wheel which works well in North America but requires vast amounts of energy resources and employs little human labor. Africa has a reliable labor force, if it can only be used. Successful schemes for grazing management, small-scale irrigation, village-level water harvesting, soil conservation, watershed rehabilitation, fuelwood development and agroforestry already exist and merely await application on a broader scale.

For example, there is a growing conviction among specialists in low-cost irrigation that the use of buried, porous earthen pots could significantly increase crop production from small- and medium-scale cultivation in arid regions. This method, also known as "pitcher irrigation," has been successfully tested in Latin America and already has limited use in some parts of Africa. Its advantage is that it can be used at varying levels of technical sophistication and that most of the equipment can be locally manufactured.

Water harvesting, another old idea which can almost be regarded as rainfed irrigation, has found its way to the area around Lake Baringo in Kenya. Water harvesting techniques capture the runoff from high intensity rainstorms and direct it to water trees or crops in the field. Such techniques increase water for plant growth and are also effective for soil conservation. In the first year of trial, sorghum yields were 2.3 to 3 times greater than in control plots and cowpea yields were between 3.5 and 7.7 times greater.

An alternative to large and costly dams and reservoirs (and their associated environmental and health impacts) are sub-terranean dams -- structures designed to retain rainwater in a shallow stratum of the soil. It is particularly appropriate for arid or semi-arid regions where annual rainfall rarely exceeds 700 mm and occurs within two or three months of the year.

Variations of the basic system are used in the Middle East and North Africa as well as in other arid and semi-arid regions.

Conservation tillage methods, which increase the amount of moisture stored in the soil and reduce soil erosion, have been used successfully in Ghana where they have increased grain yields, reduced runoff by 70-90%, and cut soil erosion by about 95% of that from conventional ploughing methods.

Animal power is not now well used in farming or for water pumping in sub-Saharan Africa. It is estimated by the United Nations Environment Programme that if one in three of the region's 200 million domestic animals were put to work for four hours a day, about 13 million horsepower per year could be generated to boost food production.

There is also a critical need for expanded agricultural research to develop better varieties of grain that can withstand extreme weather conditions. However, the best way to encourage the development of that research, as well as research into improved soil and water conserving measures, is in Africa itself, which would allow immediate feedback from local farmers and would permit field tests under realistic conditions.

We also need to improve information on the resource base (soils, water, etc.) and assist in developing local African capabilities for gathering relevant information and for studying conditions and trends that affect food production. The importance of studying the earth as a system, and of better understanding natural processes and changes, cannot be overemphasized. And nowhere is there such urgency as for Africa. We need to harness the power and capabilities of remote sensing techniques to gain comprehensive knowledge of the continent. We have better maps of the moon than of Africa. We also need to employ new analytical techniques to better determine land capability and optimum land-use approaches.

Whatever methods and practices are developed, their successful implementation requires equal attention to education and training, as well as to the dissimination and marketing of ideas and products resulting from research. Effective action will also require the pooling of available resources, capabilities, and technical information. This includes those of national governments, donor organizations, non-government organizations (NGOs), and private voluntary organizations (PVOs).

The Environmental and Energy Study Institute (EESI) task force report released early this month makes a series of recommendations to Congress on how the United States could help address the growing environmental and natural resource problems in the developing world. The task force is non-partisan and includes leaders from U.S. corporations, environmental and development organizations and the Congress. Task force members are listed in the report, a copy of which I am attaching for the hearing record.

The Environmental and Energy Study Institute was recently established by the leaders of the Congressional Environmental and Energy Study Conference to carry out independent, credible policy analysis and develop innovative policy recommendations. EESI's developing country resource program is one of its top priorities.

Africa was not the sole focus of the task force's work. But the recommendations identified by the task force are particularly appropriate to the needs of most African countries. The panel proposed a new, more cost-effective approach to development aid, not big new expenditures. This approach stresses R&D transfer, training and other initiatives to build local self-sufficiency. This approach calls for a shift away from big, capital-intensive projects toward smaller-scale projects which efficiently use energy, water and other resources--and which are economically and environmentally sustainable.

The EESI task force started from the premise that the Congress should act to bolster and support institution-building efforts designed to strengthen the ability of developing countries themselves to make informed decisions and carry out effective policies. We wanted to develop initiatives to help developing countries "help themselves," and to manage their own resources.

The task force report, "A Congressional Agenda for Improved Resource and Environmental Managment in the Third World: Helping Developing Countries Help Themselves," includes 13 recommendations that we feel are both politically and economically realistic. They represent much of the best thinking available on what Congress can do now. Those recommendations call on Congress to:

- Enact a new mandate to require the U.S. Agency for International Development to promote environmentally sustainable development projects.
- Expand the PL 480 "Food for Peace" program to conserve tropical forests and their genetic resources, upon which future medical advances and increased food production will depend.
- Strengthen developing country environmental ministries and non-governmental organizations.
- Increase the transfer of U.S. environmental and natural resource research relevant to the needs of poverty-stricken developing countries.
- Expand environmental and development training programs for developing countries.
- Study the feasibility of policies which encourage sound resource mangement as part of the management of debts owed to the United States by the developing world.

- Strengthen Peace Corps environmental efforts.
- Press the multilateral development banks to promote sound management of natural resources and discourage development projects which undermine the resource base.
- Support the United Nations Environmental Program.

Overall, this set of recommendations encompasses a range of process-oriented actions designed to increase the attention paid to these issues within the U.S. government and to enhance the ability of developing country leaders to better manage their resources for sustainable development. This is a particular appropriate approach for many African countries.

Mr. Chairman, let me close by saying that new development strategies for Africa must be grounded in a firm understanding of the integrated nature of resource systems. Integrated resource management is the key to increasing resource productivity. Yesterday, October 22, 1985, an international task force organized by the World Resources Institute, in cooperation with the World Bank and the United Nations Development Programme, released a 56-country plan to reverse destruction of tropical forests. The plan focuses on translating known solutions and strategies into a five-year program of accelerated action. The action program addresses five issues: fuelwood and agroforestry; land use on upland watersheds; forest management for industrial uses; conservation of tropical forest ecosystems; and strengthening institutions for research, training and extension. The action plan illustrates the type of integrated resource management approaches that are essential to the sustainability of future development strategies.

Thus far, most governments and donors have failed to recognize the inter-relationships among resource sectors, often enhancing one resource at the expense of another. Furthermore, resource management has never been a priority of development planners. The words "integrated resource management" must now take on dual significance, referring to both integrated management of the land, water, forest, and energy sectors, and the integration of resource management into the overall economic development process. To do otherwise is to fight nature and perpetuate environmental -- and human -- destruction.

ENVIRONMENTAL AND ENERGY STUDY INSTITUTE

A CONGRESSIONAL AGENDA FOR IMPROVED RESOURCE AND ENVIRONMENTAL MANAGEMENT IN THE THIRD WORLD:

HELPING DEVELOPING COUNTRIES HELP THEMSELVES

Prepared by a Task Force
of the Environmental and Energy Study Institute

October 1985

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EESI is an independent, non-partisan policy analysis organization. It works closely with the Congressional Environmental and Energy Study Conference, its members and other policymakers to inform the debate on important national issues and develop innovative and well-balanced policy responses.

The director of EESI's developing country resources project is Jon Clark.

This report has been approved by the EESI Board of Directors: Richard L. Ottinger, Chairman; Thomas B. Evans, Vice Chairman; Carleton D. Burtt, Secretary-Treasurer; Robert O. Blake; Gerald Decker; Joseph L. Fisher; John Heinz; Paul N. McCloskey; Edmund S. Muskie; Ruth Patrick; John R. Quarles; Roger W. Sant; John J. Sheehan; Harlan T. Snider; James Gustave Speth; Elvis J. Stahr; Victoria J. Tschinkel; and Larry Young.

* * * * * *

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TABLE OF CONTENTS

Foreword 1

Introduction 4

Recommendation 1: Long-term Assistance to Africa 11

Recommendations 2-5: New Leadership by AID 13

Recommendation 2: Establish New AID Natural Resources Policy and Bureau 13

Recommendation 3: Strengthen Developing Country Environmental Authorities 17

Recommendation 4: Build Indigenous Non-Governmental Organizations 21

Recommendation 5: Improve Environmental and Related Development R&D 23

Recommendation 6: Enhance Environmental and Related Development Training 26

Recommendation 7: Strengthen Peace Corps' Environmental Focus 29

Recommendation 8: Focus Multilateral Development Bank Attention on Resource Issues 32

Recommendation 9: Expand P.L. 480 Program to Include Conservation of Biological Diversity ... 35

Recommendation 10: Review Options for Using Foreign Debt to Encourage Sustainable Development 39

Recommendation 11: Review International Natural Resource Programs in U.S. Agencies 42

Recommendation 12: Incorporate Natural Resource Assessments Into Project Cost/Benefit Analysis 44

Recommendation 13: Support the United Nations Environment Program 48

FOREWORD

The Environmental and Energy Study Institute (EESI) convened this task force to address natural resource and development issues in developing countries just as the U.S. Congress was debating two critical items: the need for supplemental appropriations to feed the victims of the African famine and the tragic chemical accident in Bhopal, India. Although the EESI task force was conceived well before these events became front page news, they gave new urgency to our effort to help the developing world meet its long-term resource and development needs.

The EESI task force is non-partisan and includes leaders from U.S corporations, environmental and development organizations and the Congress. The goal of the task force has been to develop an agenda, on which we could all broadly agree, for congressional action to help developing countries better manage their resources for sustainable development.

Our effort is distinctive for a number of reasons: we sought to develop politically realistic and fiscally restrained recommendations for congressional action; we represent diverse interests and perspectives; and we have concentrated on initiatives to help developing countries "help themselves." The focus on congressional action was particularly appropriate because EESI's sister organization, the Congressional Environmental and Energy Study Conference, represents the legislators who can put our recommendations into effect.

We began our work from the premise that the developing world's long-term growth depends upon sound environmental and natural resource management. We all believe that the United States has a special responsibility and also the capability to provide help in promoting environmentally sustainable development in developing countries that desire such assistance. Furthermore, we believe that there are actions the U.S. Congress could take to help.

We also began with the premise that the long-term environmental, economic and political interests and national security of the United States depend far more than has been generally acknowledged on the success with which developing countries can wisely manage their resources for sustainable development. We believe that the only lasting way to achieve sound environmental and resource management in developing countries is to strengthen the capability of these countries to do so.

The action agenda which follows synthesizes much of the best thinking available on what Congress can do to help developing countries help themselves. It is only a beginning. But our effort itself represents an important step toward the creation of the new ideas, new leadership and new coalitions necessary to help the developing world achieve sustainable development.

We now call on the U.S. Congress to take the next step, to make this proposed agenda for action a reality.

Finally, we would like to express our thanks to Ken Murphy, EESI executive director, and Jon Clark, director of the developing country project, for their outstanding work on this report.

THE TASK FORCE

Gus Speth, Task Force Chair; President, World Resources Institute
Robert O. Blake, Senior Fellow, International Institute for Environment and Development
Barbara Blum, Chair, Environmental Policy Institute; President, Women's National Bank
The Honorable Don Bonker, Chair, House Subcommittee on International Economic Policy and Trade
Nan Borten, Executive Director, International Volunteer Services
The Honorable John H. Chafee, Chair, Senate Subcommittee on Environmental Pollution
Harold Corbett, Senior Vice President, Monsanto
The Honorable Benjamin A. Gilman, House Committee on Foreign Affairs
Robert D. Havener, President, Winrock International
Philip Johnston, Executive Director, CARE
Bruce Karrh, Vice President, E.I. du Pont de Nemours & Co.
The Honorable Mickey Leland, Chair, House Select Committee on Hunger; Chair, Congressional Black Caucus
The Honorable Charles McC. Mathias, Jr., Chair, Senate Subcommittee on International Economic Policy
Joan Nicholson, Washington Representative, United Nations Environment Program
Richard L. Ottinger, Chair, Environmental and Energy Study Institute
The Honorable Claiborne Pell, Ranking Minority Member, Senate Committee on Foreign Relations
William D. Ruckelshaus, Member, United Nations World Commission on Environment and Development; former administrator, U.S. Environmental Protection Agency
The Honorable Claudine Schneider, Ranking Minority Member, House Subcommittee on Natural Resources, Agriculture Research and Environment

The Honorable John Seiberling, Chair, House Subcommittee on Public Lands
John Sheehan, Legislative Director, United Steelworkers of America
Ralph Smuckler, Dean, International Studies and Programs, Michigan State University; Chair, Board of Science and Technology for International Development, National Academy of Sciences
Tom Stoel, President, Global Tomorrow Coalition; Director, International Program, Natural Resources Defense Council
Lee Talbot, Fellow, East-West Center, World Resources Institute
The Honorable Howard Wolpe, Chair, House Subcommittee on Africa
The Honorable Gus Yatron, Chair, House Subcommittee on Human Rights and International Organizations

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INTRODUCTION

Much of the developing world is in the midst of an environmental and natural resources crisis which is undermining its drive for sustained economic growth. Whether one examines the management of dangerous chemicals, dependence on expensive energy imports, pollution levels, the loss of forests and biological diversity, or land deterioration resulting from deforestation and desertification, a similar conclusion emerges: the problems of the poor countries generally make those of the United States and other rich countries pale by comparison. Moreover, because the struggling economies of the developing world generally are closely tied to the use of natural resources, the widespread deterioration of the renewable resources base has serious implications for the future, particularly when viewed together with rapidly expanding populations and the increasingly intricate economic and security interconnections among all nations.

Task Force Chair Gus Speth stated at the outset of our effort that a new environmental agenda is emerging for the United States. He said that issues on this agenda "represent new policy and political challenges for the United States, challenges that are more international and global in scope and implication...Today, issues arise from the spread of deserts, the loss of forests, the erosion of soils, the growth of human populations, the exhaustion of ecological communities, the accumulation of wastes, and the alteration of the biogeochemical cycles of the planet. These newer environmental concerns transcend borders, national laws and local customs. As a result, the politics needed to meet present and future challenges require a new vision and a new diplomacy, new leaders and new coalitions."

The United States has a direct and, as the situation worsens, a growing interest in the environmental and natural resource problems of the developing world. The tragic accident in Bhopal, India, and the famine that continues to afflict many of the countries in Africa underscore the fact that the United States must be concerned about resource issues in the Third World. Humanitarian and environmental values are at stake, but so are U.S. economic and security interests. Events like Bhopal can fuel anti-American sentiment and provide support for efforts to unduly restrict the operations of U.S. companies, thus diminishing the prospects for mutually beneficial direct foreign investment.

Less dramatic than the Bhopal accident but inestimably more serious globally is the continuing environmental degradation which reduces the capability of nations to support their people. The starvation throughout Africa illustrates this point all too well, but the problem involves most developing countries to a greater or lesser extent. U.S. political, economic and national security interests are affected when resource challenges are not met. This failure leads first to economic and social stresses and then to political instability or authoritarian measures -- developments that undermine free institutions and trigger armed conflict.

Environmental degradation in developing countries affects the United States in many ways. In addition to development assistance from the U.S. government, for example, the U.S. banking community has lent many billions of dollars to developing countries. Continued environmental and resource degradation, coupled with heavy reliance on energy imports, reduces these nations' ability to pay back their outstanding debts.

These issues demand attention by the United States because they are inextricably linked to other pressing international goals: expanding international trade and markets, improving North-South relations, promoting sustainable economic development and ensuring long-term political stability in the Third World.

Increasingly, Third World leaders are showing concern about environmental and resource deterioration. And rightly so. Conservation of the productive resource base -- soils, fisheries, forests -- is particularly critical in developing countries, which on average are six times more dependent than industrial countries on these natural resources.

Yet, while legislation to protect the environment in developing countries is now virtually universal, implementation, enforcement and monitoring are often grossly deficient. Even where the political commitment is present, lack of information, staffing shortages, poor training, inadequate technical resources and lack of financial resources all create special vulnerability.

Fundamentally, a country's capability for managing its resources and environmental affairs must be its own. Unfortunately, with all too few exceptions, developing countries do not have the needed capability. In light of the seriousness of the global resource situation, and its importance to U.S. interests, a concerted U.S. effort led by the Congress is now urgently needed to help developing countries help themselves manage their resources and environment for sustainable development. The key questions are: What can the United States do to strengthen the capability of officials and other leaders in developing countries to better cope with their environmental and resources challenges? How can we help them achieve agricultural, energy and industrial development that is sustainable?

To begin to answer these questions, the Environmental and Energy Study Institute (EESI) initiated this project, entitled "Helping Developing Countries Help Themselves: Toward a Congressional Agenda for Improved Resource Management in the Third World."

EESI convened a task force made up of U.S. corporate, environmental, development and Congressional leaders to identify actions, outlined in the body of this report, that the U.S. Congress can take to help developing countries better manage their resources for sustainable development. Paralleling this effort, EESI has launched a series of initiatives to increase awareness among Members of Congress, Congressional staff and other decision-makers of the environmental and natural resource needs in the developing world.

A guiding principle behind the task force's work was that the United States should not impose its environmental systems on the developing countries. Instead, the task force started from the premise that the Congress should act to bolster and support institution-building efforts designed to strengthen the ability of developing countries themselves to make informed decisions and carry out effective policies.

To ensure that this principle was addressed, EESI established an advisory group of environmental leaders from throughout the developing world. The group also helped the task force ensure that their recommendations met real needs in the developing world. (A complete list of foreign advisors is included in Appendix A.) The comments received from the group of foreign advisors were generally strongly supportive, and many of their suggestions have been incorporated into the recommendations.

A Framework for Action

The task force used the following framework for action to organize its deliberations.

Provide Leadership. In view of the United States' position in the world family of nations, we often must -- and can -- assume a leadership role in improving environmental and resource management in the Third World.

Historically, the United States played a leading role in management of renewable resources such as forests, rangelands, and wildlife, both in terms of management of its own resources and of development of principles, policies and programs which often have been followed by other nations.

In the early 1970s, the United States gave leadership in international environmental and resource deliberations. U.S. leadership, for example, played an important role in establishing the United Nations Environment Program, in securing the Washington Convention (on control of trade in endangered species) and other international agreements, and in calling world attention to environmental concerns. Such a role is crucially needed now, focused on such issues as population, poverty, agrarian reform, renewable energy and generally on assuring that developing nations achieve truly sustainable development based on sound environment and resource management -- which utimately must be based on self-reliance. Such leadership should be exercised by Executive Branch actions, but a strong Congressional voice heard internationally is essential.

Set an example at home. Most Americans do not realize the impact our domestic policies and programs have abroad. In the early 1970s, when the United States established domestic policies and institutions and took vigorous domestic actions to deal with environmental and resource issues, our example was emulated by many other nations, both developed and developing. Partly as a result of our domestic actions, environment and resource issues were placed high on the agendas of many nations. Similarly, in the early 1980s, when the United States was seen to be pulling back from these issues, the loss of momentum had international repercussions.

Provide intergovernmental assistance. Our primary means for providing direct bilateral assistance to developing countries is through the Agency for International Development, but EPA, NASA, the Peace Corps, the Departments of Energy, Agriculture, Commerce, Interior, State and Treasury, as well as other agencies throughout government, also have international programs that can contribute significantly to improving environmental and resource management in developing nations. We also make important contributions to international development through such multilateral organizations as the World Bank and the United Nations Development Program. Through our membership on the governing bodies of these and other organizations, we can have a significant voice in their policy making.

Provide other forms of assistance. In addition to assistance through bilateral and multilateral development assistance institutions, Congress can facilitate and encourage other ways to help developing countries improve their capability to manage their own environment and resources. These include, but are not limited to, provision of U.S. experience and information, training, scientific and technological exchanges and support for non-governmental organizations in the countries involved.

Support international cooperation. U.S. participation in and support for international environment and resource conventions and other agreements may be crucial to their success, and they certainly contribute significantly to their effectiveness. The same is true of U.S. participation in such international organizations as the United Nations Environment Program.

Although this framework served to organize the EESI task force's work, we have chosen to organize the recommendations in this report by agency and congressional committee jurisdiction in order to facilitate their consideration. Some of the proposed recommendations include specific legislative and report language. Others will require additional refinements.

Summary of Recommendations

The recommendations for Congressional action identified by the task force should be viewed as a package of interrelated and mutually supportive actions. The major recommendations are:

- Provide Long-term Resource Restoration Assistance to Africa
- Establish New AID Natural Resources Policy and Bureau
- Strengthen Developing Country Environmental Authorities
- Build Indigenous Non-Governmental Organizations
- Improve Environmental and Related Development R&D
- Enhance Environmental and Related Development Training
- Strengthen Peace Corps' Environmental Focus
- Focus Multilateral Development Bank Attention on Resource Issues
- Expand P.L. 480 Program to Include Conservation of Biological Diversity
- Review Options for Using Foreign Debt to Encourage Sustainable Development

- Review International Natural Resource Programs in U.S. Agencies

- Incorporate Natural Resource Assessments Into Project Cost/Benefit Analysis

- Support the United Nations Environment Program

Many of the recommendations stress the need to take environmental and natural resources factors into account in development activities to ensure their long-term success. Comprehensive assessments of environmental conditions, when carried out, have proven invaluable to officials of developing countries in the planning, execution and management of development efforts.

However, such assessments are seldom used. One reason is that they are mistakenly confused with the U.S. environmental impact statement process, which has a reputation for blocking economic development.

The new approach to environmental assessment and management points out the opportunities for sustainable use of natural resource systems for development, as well as adverse impacts which can undermine the development effort itself. It is this positive approach which the recommendations envision.

To a large extent, these recommendations represent an integration and synthesis of existing analysis, not original research per se. The studies called for in various areas reflect the fact that this is a relatively new field for policy analysis and action.

Since the task force concentrated its effort on Congressional actions to help developing countries help themselves, the recommendations do not address other entities or policy issues. Of course, the private sector, particularly the non-governmental organizations, industry and academia, have much to contribute, and should be involved in carrying out many of the recommendations.

Taken together, the recommendations recognize that there is no one easy way to promote environmentally sustainable development in the developing world. Rather, the recommendations encompass a range of process-oriented actions designed to increase the attention paid to these issues within the U.S. government and to enhance the ability of developing country leaders to better manage their resources for sustainable development.

This package of recommendations comes at a time when massive federal deficits require economies in federal spending. However, most of the recommendations for Congressional action represent very low-cost or no-cost items. Indeed, many are intended to lead to economies in the programs they address. For example, adequate environmental assessments of development assistance projects can avoid expensive and wasteful mistakes in project design and implementation. Therefore, they can lead both to less costly and more effective assistance. Furthermore, programs that build developing country capabilities through training and institution-building generally involve quite low costs.

* *

The Environmental and Energy Study Institute would like to thank the members of the task force and their staffs for the enthusiasm and expertise they brought to this effort. The Institute is particularly indebted to Gus Speth, chairman of the task force and President of World Resources Institute (WRI), for his leadership and for sponsoring the preparation of the policy options paper, "Helping Developing Countries Help Themselves: Toward a Congressional Agenda for Improved Resource and Environmental Management in the Third World," which served as the basis for the task force effort and for many of the proposed recommendations. We also are particularly indebted to Lee Talbot, task force member and Visiting Fellow at WRI and Fellow at the East-West Center, who authored the options paper.

We also want to thank the developing country advisory group and the large number of other people who helped in various ways in the preparation of this agenda. We have benefited from the insight and expertise of individuals from many institutions, among them: the Agency for International Development, CARE, committees and subcommittees of the Senate and House, Congressional Research Service, East-West Center, E.I. du Pont de Nemours & Co., Environmental Policy Institute, Global Tomorrow Coalition, InterAction, International Institute for Environment and Development, International Volunteer Services, Monsanto Company, National Academy of Sciences, National Wildlife Federation, Natural Resources Defense Council, Office of Technology Assessment, United Nations Environment Program, United Steelworkers of America, Winrock International, World Bank, World Environment Center, World Resources Institute, Worldwatch Institute and World Wildlife Fund.

Recommendation 1: Long-term Assistance to Africa

Congress should take action to address the environmental and natural resource problems of famine-stricken countries in sub-Saharan Africa in order to increase agricultural productivity and reduce long-term food aid requirements.

Background

In recognition of the underlying environmental and natural resource problems in many of the famine-stricken countries in Africa, the EESI task force adopted the following policy statement at its first meeting:

> In addition to food relief to alleviate the current African famine, Congress must consider long-term investments now to rehabilitate Africa's seriously degraded agricultural resources and environment so that famine does not become a regular occurrence. As many as 150 million people are now affected by the drought in Africa. Commendably, the United States Congress has responded to this immediate need by contributing over a billion dollars in food assistance to the continent.
>
> However, soil erosion, water depletion, and deforestation -- which result from drought, overexploitation of resources, misdirected resource policies and very high population growth -- are seriously undermining Africa's efforts to increase per capita food production.
>
> Congress should emphasize environmentally sound agricultural development policies and projects which will increase food production while helping to restore the continent's fragile natural resource base. This can be done in part by redirecting and better harnessing existing U.S. programs and by bolstering the private sector within affected African countries. Serious consideration also should be given to increased U.S. support for such measures.

> Immediate attention to these issues can reduce Africa's long-term food aid requirements -- and make U.S. expenditures more cost-effective.

On June 18, 1985, Congressman Benjamin A. Gilman, a member of the EESI task force and the second ranking Republican on the House Foreign Affairs Committee, introduced legislation to address long-term environmental and natural resource needs in sub-Saharan Africa. H.R. 2782 authorizes $75 million for small-scale rehabilitation and recovery projects to help restore the natural resource base in the African countries affected by the current famine. Senator Nancy Kassebaum has introduced in the Senate S. 1364, which is identical except that it authorizes no new money and directs the $75 million to be taken from existing AID funds.

Needed Congressional Action

The Congress should enact legislation, such as H.R. 2782 or S. 1364, to help restore sub-Saharan Africa's resource base and promote long-term development. Because of the urgency of the situation, Congress should give serious consideration to authorizing the additional money proposed in the Gilman bill. Not withstanding current budgetary pressures, this modest investment can substantially reduce the need for continued massive food aid expenditures in the future.

Recommendations 2-5: New Leadership by AID

The United States Agency for International Development (AID) is the world leader among development assistance institutions in incorporating environmental and natural resource management considerations in projects it supports. It has a specific congressional mandate for this (Sections 118 and 119 of the Foreign Assistance Act), and it has been more creative than many other development assistance institutions in its procedures and programs, particularly in the areas of training and institution-building to increase the capacity of developing nations. Yet, AID is a large organization, with some 5000 personnel and activities in approximately 70 nations, and change in large organizations occurs slowly. For example, most AID activities still involve the sectoral approach to technical assistance, little affected by cross-sectoral environmental analysis. AID often still employs an out-dated method of cost-benefit analysis that undervalues or neglects environmental problems and opportunities. And there are still relatively few AID personnel who are trained to take environmental factors into account, much less who are trained environmental professionals.

The following recommendations (numbers 2-5) are designed to strengthen the agency's environmental and natural resources management effort, which will help to enhance the developing world's own management capability.

Recommendation 2: Establish New AID Natural Resources Policy and Bureau

The Congress should enact a new environmental and natural resources policy directive for the U.S. Agency for International Development and establish a new Bureau of Environment, Forestry, Energy and Natural Resources.

Background

Development assistance agencies have great potential for helping developing nations strengthen their capacities for environmental and natural resource management. U.S. AID, which administers the U.S. bilateral assistance program, has been the world leader in this area.

In response to congressional mandates, AID's spending in this field increased more than 10-fold between 1978 and 1983, to a peak of about $150 million. AID hired new staff members with relevant backgrounds and provided internal policy guidance.

Despite AID's efforts, natural resource problems in developing countries are becoming more serious. However, the picture is by no means hopeless. We have learned much about how to solve these problems, and many of these techniques are remarkably cost-effective.

Analyses indicate that developing countries would benefit greatly from techniques which make more efficient use of energy, water and other resources. These methods not only would conserve natural resources but would obviate the necessity for poor nations, strapped by the debt crisis, to spend scarce foreign exchange on capital-intensive approaches.

AID should be placing a higher priority on increased efforts to address natural resource and environmental problems. Instead, AID's spending on environment and natural resources has dropped for three consecutive years and is down almost one-third.

The agency's most recent and authoritative analysis confirms this negative trend. The agency recently issued its first strategic plan, entitled "Blueprint for Development: The Strategic Plan of the Agency for International Development." This 64-page document devotes 25 lines to environment and natural resources. It proposes no significant new initiatives in environment or natural resources. An appendix, "Specific Steps AID Will Take To Address Key Problems," states only that AID intends to help countries "move toward...expanded supplies of fuelwood or alternative energy resources and increased efficiency of their use." Fuelwood is the area where AID already is most active.

For AID to increase its efforts, the Agency must have policies which assign a higher priority to these problems. Since the blueprint developed by the agency does not adequately take environmental considerations into account, this direction must come from the Congress.

An overall congressional policy declaration would draw attention to the extent of environment and natural resource problems in developing countries, the importance of these problems to the United States and the necessity of U.S. actions to address them. It would emphasize the strength of congressional interest and send a signal to developing countries and other donor nations. It would provide a legal mandate and a framework and rationale for strong, sustained efforts and guidance as to the policies the agency should pursue.

Currently, the main focal point for environmental and natural resource issues within AID is the Office of Environment, Forestry and Natural Resources in the Bureau of Science and Technology. This office has only a handful of staff members.

Under this setup, both the level and amount of attention to these problems is far too low. If AID is to give adequate attention, the agency must have a substantial number of well-qualified people to design and administer centrally funded projects and give the Missions the technical support and advice they need. AID is primarily made up of economists and generalists, who need a great deal of help in identifying, designing and implementing environment and natural resource projects. A handful of professionals cannot possibly meet these needs.

Moreover, the current office is at too low a level to gain these issues the attention they deserve. The office has no congressional mandate, and its director is too low-ranking to represent the agency before the Congress. It is constantly threatened with reductions in budget and staff strength. Its recommendations too often receive inadequate attention within the agency.

Environmental and natural resource issues will get the large-scale, sustained attention they deserve only if high-level officials are appointed to look after them on a full-time basis and are backed up by a substantial number of qualified, permanent employees. This can be done by establishing a new bureau headed by an assistant administrator.

Needed Congressional Action

Congress should amend Chapter 1 of Part 1 of the Foreign Assistance Act of 1961 by inserting the following:

"Sec. 118. Environment and Natural Resources.

"(a) Findings. -- The Congress finds that:

"(1) The efforts of developing nations to meet basic human needs, achieve sustained economic development and prevent internal and international conflict are being undermined by such problems as destruction of tropical forests, soil erosion, desertification, uncontrolled flooding, loss of water supplies, extinction of wildlife species, misuse of hazardous or toxic substances and pollution of air, fresh water and the marine environment. In many nations, these problems are growing worse, exacerbated by rapid growth in human populations. The Congress also finds that the world faces enormous, urgent and complex problems with respect to natural resources and the environment which require new forms of cooperation between the United States and developing countries to prevent such problems from becoming unmanageable.

"(2) Unless environment and natural resource problems in developing nations are solved, the security and welfare of the United States will be adversely affected due to reduced economic development in these nations, with negative impacts on the world's economy and decreased trade flows; unrest and violence which will deny human rights, undermine economic development, require poor nations to make excessive military expenditures and necessitate costly actions by the United States to protect our security; the necessity of responding to calls for massive emergency food aid; and inability of these nations to cooperate in solving other critical international problems.

"(3) It is in the national interest of the United States to assist developing nations to protect and restore their environment and natural resources, in order to safeguard our own economic and security interests, prevent human suffering and unwanted dependence on foreign aid, meet basic human needs and promote economic development. The magnitude of the problems necessitates a substantial increase in this kind of assistance.

"(b) Authority and Priorities. -- The President is authorized to furnish assistance under this part to strenghthen the capacity of developing nations to protect and manage their environment and natural resources for sustainable development. In providing such assistance, the President shall --

"(1) make special efforts to maintain and where possible restore the land, vegetation, water, wildlife and other resources upon which depend economic growth and human well-being, especially of the poor; and

"(2) place a high priority on --

"(A) support for small-scale, affordable, resource-conserving, low-risk, local projects, using appropriate technologies and methods suited to the local environment (such as renewable energy sources) and featuring close consultation with and involvement of local people at all stages of project design and implementation;

"(B) utilizing the capabilities of local government organizations (such as village councils), local non-governmental organizations, foreign private and voluntary organizations or Peace Corps volunteers, using national and international non-governmental organizations as intermediaries when appropriate;

"(C) support for training and institution-building to improve the capacity of developing countries to manage their own environment and natural resources, including the establishment or strengthening of soil conservation, forestry and extension services; regional institutions; and programs and agencies to control pollution and hazardous or toxic substances,

"(D) improving the efficiency of use of natural resources, as by supporting energy or water conservation efforts;

"(E) support for research to discover methods of meeting human needs which are efficient, resource-conserving and environmentally sound.

"(c) New Bureau. -- To help provide the increased assistance needed to protect and restore the environment and natural resources of developing nations and to ensure that the United States provides international leadership, there is established in the Agency for International Development a Bureau of Environment, Forestry, Energy and Natural Resources."

The reports of the House and Senate Committees should include the following language:

> The Committee recognizes the competing demands for money from the Operating Expenses account, which provides funds for personnel for AID programs. However, the Committee believes this initiative will result in more cost-effective AID projects and thus merits reallocation of resources as necessary.

Recommmendation 3: Strengthen Developing Country Environmental Authorities

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The Congress should help strengthen environmental authorities in developing countries by (1) promoting institution-building efforts designed to bolster these agencies and (2) requiring countries receiving U.S. assistance to submit comments assessing the environmental and natural resources aspects of any development project.

Background

Although 110 developing countries have governmental environment agencies of some sort, a 1,000 percent increase since 1972, many of them are new, inadequately staffed and lacking in political power. Some are one-person offices or interagency coordinating committees with no independent authority. Still valid is a 1979 AID report to the Congress which said that the lack of an adequate institutional infrastructure is a major impediment to the mounting of an effective environmental effort. In the majority of cases, said a later report, the result of conflict with other government agencies typically has been that the newly created environmental institutions are forced to focus on narrow pollution issues -- an approach which minimizes friction because it usually involves no usurpation of powers. Or they are consulted late, their views are ignored, or they are overruled.

Although Congress (in Section 118(b) of the Foreign Assistance Act) and AID have correctly identified the problems of environmental governance and stressed its importance, little has been done to address it. Institution-building is admittedly a difficult task for a donor agency, but AID and other development assistance agencies have been deeply involved for many years in assisting major ministries such as agriculture, health and housing. AID's policy statement, "Environmental and Natural Resource Aspects of Development Assistance" (April 26, 1983), stresses that it is AID policy to assist countries to improve their national policies on environment and natural resources and to strengthen their institutional and scientific capability. AID sees its Country Environmental Profiles and Natural Resource Assessments as means to these ends. AID also makes its own environmental assessments of its major actions, as required by Section 118 of the Foreign Assistance Act. Nonetheless, AID and other donors need to address much more explicitly the question of the institutional capability of the host country's environmental arm. Central to that assessment is the question of the environmental agency's authority and its ability to exercise cross-cutting policy management on matters of environmental or natural resource importance.

Needed Congressional Action

Through a combination of amendments to Section 118 of the Foreign Assistance Act and report language to amplify the law as amended, Congress could act in a significant way to strengthen environmenal authorities in the developing countries which receive U.S. assistance and loans.

1) Congress should amend Section 118(b) of the Foreign Assistance Act to explicitly provide for assistance in strengthening institutional capabilities. After the language "...the President is authorized to furnish assistance under this part for developing and strengthening the capacity of developing countries to protect and manage their environment and natural resource," replace the period with a comma and add "including assistance to the environmental and natural resources agencies and authorities of developing countries to strengthen their institutional capabilities to manage environmental and natural resource policies and programs."

The reports of the House Committee on Foreign Affairs and the Senate Committee on Foreign Relations could more precisely define the legislative intent with language such as the following:

> Recognizing that many of the newly created environmental agencies in developing countries are weak and inadequate, the U.S. Agency for International Development should more explicitly address the issue by maintaining an on-going program in institution-building.
>
> Because an important element of a country's "capacity" is the policy authority assigned environmental officers and agencies, non-project assistance for long-term institution-building should aim at bolstering the ability of such officers and agencies to manage environmental policies across major departments and ministries, including the ministries of finance and planning where appropriate. AID's Country Environmental Profiles should highlight any issue relating to the ability of an environmental agency of a developing country to manage environmental policies and to coordinate them effectively. AID should ensure that contractors responsible for giving assistance on Environmental Profiles place high priority on this aspect and have available expertise in public administration and policy management. AID should appreciate that advice on how a new environmental agency engages in policy management across long-established ministries is a particularly difficult and challenging problem in public administration. Strengthening such an agency has to be

regarded as a long-term process. AID should, therefore, regard the Profile preparation as but a beginning and should be prepared for follow-up funding to address the inadequacies highlighted by the Profile.

AID should also ensure that the preparation of Country Environmental Profiles or other similar documenting work include steps to ensure consultation with relevant ministries and with non-governmental organizations working in the country and are produced in sufficient quantities to be made available to other donors and countries. AID should take every opportunity to bolster a developing country's environmental agency and institutions, including provison of technical and financial assistance and retention of local private contractors.

AID should prepare a report within one year of enactment on its efforts to carry out this provision.

2) Section 118(c)(1)(B) already clearly stipulates that the President "shall require all agencies and officials responsible for programs or projects under this chapter....to prepare and take fully into account environmental assessment of any proposed program or project...significantly affecting the environment of any foreign country."

In order to assure that this process lends itself as fully as possible to the strengthening of environmental authorities in host countries, a new section (C) should be added requiring that any country receiving loans or grants from the United States provide comments on the environmental impact of the development project. This requirement could prove quite effective in stimulating the creation and strengthening of developing country environmental authorities.

This new section should read: "(C) to obtain comments from environmental officials in countries where the project is located assessing the environmental impact for projects funded by the the United States government which relate to, or affect, agriculture; transportation; facility siting; watersheds; soils; ground, coastal and fresh water systems; toxics, chemicals and pesticides; forestry or fisheries; to ensure the protection of public health, the project's cost effectiveness and the sustainability of such projects."

Report language such as the following could more precisely define the legislative intent of Section 118(c)(1)(B) and (C):

> U.S. agencies and officials should ensure that their environmental assessment be part of the project planning process and be carried out early enough in the process that it can affect decisions on the project and that the assessment be consistent with previous guidance issued by the agency itself, such as, for example, AID's "Humid Tropical Forests Policy and Program Guidance" of November 1984, and other similar guidance. The assessment should be prepared jointly with the host government, use local private contractors and consultants to the maximum extent possible, and include consultations with relevant ministries and with NGOs. Where environmental authority is lodged at a ministerial level or in an office with national responsibilities close to the country's Chief Executive, the relevant U.S. agency should obtain written comments, which explicitly address the relevant environmental issues, or, if the relevant U.S. agency deems it advisable, formal approval for the project.
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> AID should prepare a report within one year of enactment on its efforts to carry out this provision.

Recommendation 4: Build Indigenous Non-Governmental Organizations

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Congress should direct the Agency for International Development to improve current efforts to strengthen environmental and resource related non-governmental organizations (NGO'S) in developing countries.

Background

Experience shows that a vital element in improving environmental and resource management in developing countries is the existence of a politically potent national constituency. Such a constituency is necessary to convince a government to seek to understand the environmental dimension of economic development, to put good resource management higher on its scale of priorities, to create the institutional framework to put such programs into action, and to dedicate enough money and attention to get the job done. AID several years ago came to the conclusion that without such a base of local support, many nations would give little attention to environmental principles and the long-term costs of ignoring them. Accordingly, beginning in 1978, AID began to make grants with the objective of forming or strengthening local environment and resource-oriented organizations.

Dr. Nyle Brady, Senior Assistant Administrator of the Bureau of Science and Technology at the Agency for International Development, has reported that, "AID has a variety of efforts underway to build environmental and natural resource capability. AID is supporting less developed country private voluntary organizations with environmental interests and activities in order to increase their effectiveness. Examples are grants to the Fundacion Natura in Ecuador, the Honduran Ecological Association, and the Association for Rural Development in Cajamarca, Panama." AID has also provided assistance to U.S. -based organizations to assist indigenous non-governmental organizations.

The results of those efforts have been mixed. Some very credible organizations have emerged. Other AID efforts have been less successful. The major weakness with developing country private organizations in general are institutional -- poor management, poor fundraising capability, lack of understanding of public affairs techniques -- all of which add up to a failure to create the preconditions for self-sustainability. Paradoxically, one of AID's problems has been that because of an understandable general concern about making too many contracts for too small amounts of money, AID has tended to give too few organizations too much money too soon. This has in some cases tended to discourage those elements of self-reliance which are so vital. To date, it has been too conservative about trying to make the necessary small beginnings and taking the inevitable risks.

Needed Congressional Action

Congress should encourage AID to expand its efforts to assist indigenous non-governmental organizations by adding the following report language to Section 123 of the Foreign Assistance Act and, if there is broad support, should consider amending Section 123 to direct AID to furnish such assistance and to provide that specific sums shall be available for that purpose:

> The Congress commends the current efforts of the Agency for International

Development to encourage the formation of solid local and national environmental organizations in developing countries and requests that the Agency develop a coordinated and more broadly based program in this field. Congress recognizes the risks involved in such a program but urges the Agency to undertake institution-building efforts in more countries -- even to the extent of spending less money on more organizations. In order to build self - sustaining organizations, the Agency should (1) pay more attention to management questions as well as environmental programmatic aspects of any such organization and (2) provide assistance with fundraising and public affairs techniques.

In carrying out this effort, the Congress urges the Agency to work with U.S.-based organizations involved in institution-building efforts in developing countries. In addition, AID should consider consulting with "umbrella" organizations of non-governmental organizations in developing countries for recommendations on who to assist.

AID should report back to the Congress within one year on the progress of this program.

Recommendation 5: Improve Environmental and Related Development R&D

Congress should direct the Agency for International Development, in cooperation with the National Academy of Sciences or other appropriate institution, to review and make recommendations for improving the transfer of environmental and related development R&D appropriate to the needs of the developing world.

Background

Successful development requires planners and development leaders in the developing countries to consider ecological constraints and opportunities and incorporate sound resource management in project planning and implementation. To do so, they must have sufficient information and knowledge of research and development efforts in environmental and natural resources sciences, management and technology related to development, and this information and knowledge must be relevant and appropriate to their needs. In addition, they must have their own R&D capability to design and carry out sound projects.

It is uncertain how many developing country personnel have such knowledge or R&D capability.

It also is uncertain the degree to which U.S.-generated R&D is relevant to the needs of the developing world, or the degree to which relevant R&D is being transferred in such a way to be useful.

Though uncertain the situation does not look promising. Until it is improved, the drive for successful development will be hampered.

Needed Congressional Action

Congress should require the Agency for International Development to undertake a study of the R&D situation and recommend needed improvements. Section 118 of the Foreign Assistance Act should be amended by adding, after subsection (d), the following new subsection:

> (e) In order to effectively carry out the provisions described in subsections (a) and (b), the Administrator of the Agency for International Development, in cooperation with the National Academy of Sciences or other appropriate institution, shall undertake a study to review and make recommendations for improving (1) existing means through which the United States transfers new knowledge on environmental, natural resource and related development issues and technologies to developing countries, (2) the applicability and relevance of U.S. R&D programs to meeting the goals of sound natural resource management and environmentally sustainable development in developing countries, (3) current levels of knowledge and R&D in the developing countries in this area and (4) the transfer of such knowledge and R&D among developing countries themselves.

The reports of the House Committee on Foreign Affairs and the Senate Committee on Foreign Relations could elaborate the purpose of the study with language such as the following:

> The proposed study should be undertaken by an expert U.S. panel drawn from scientists and development specialists knowledgeable and experienced in environmental, natural resource and related development issues. The panel would have an advisory group of experts from the international science, technology and development community. The U.S. panel would review the ways in which the United States assists developing countries in the development of environmentally substainable policies and programs and the appropriateness and relevance of U.S. R&D to their needs in this area. The panel will assess current efforts and make recommendations for improvement. It will be necessary for the panel to identify and evaluate current R&D efforts regarding environmental and natural resources problems and technologies related to sustainable development currently being undertaken by universities, government agencies, foundations and other private organizations in the U.S., as well as R&D efforts being carried out in the developing countries themselves with and without U.S. assistance.
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> This study should build on an earlier report prepared by the National Research Council at the request of the State Department for the 1979 United Nations Conference on Science and Technology for Development concerning the contribution of U.S. scientific and technological resources to developing country needs. Focusing on environmental, natural resources and related development issues, the proposed study should review subsequent R&D efforts in priority areas and additional ways in which the United States is attempting to meet needs in this field. It should also review ways in which developing countries are cooperating in transferring environmental R&D information and technologies among themselves and how the U.S. can assist in this process.

Recommendation 6: Enhance Environmental and Related Development Training

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Congress should act to improve U.S.-sponsored programs to train people in developing nations who have the responsibility for natural resource and environmental management.

Background

There is an alarming shortage of personnel in developing countries who are adequately trained to manage their natural resources for sustained utilization. Not only do resource managers and researchers lack needed skills, but also technicians, planners, legislators and administrators. Most importantly, the people who manage natural resources on a day-to-day basis -- the local populations -- are sorely ill-equipped to deal with the challenges and responsibilities they face.

Existing training programs have suffered from a number of general problems. For example. U.S. government agency training programs have limited statutory authority and policy guidance and no strong programmatic basis for natural resource and environmental training for foreign nationals. Other problems include the limited number and uneven distribution of regional training institutions, inadequate local-level training opportunities, poor coordination between government and non-government training programs and insufficient funding.

Needed Congressional Action

Training of foreign nationals may be the best way to foster long-term solutions to natural resource and environmental management in the developing world.

As a first step toward strengthening U.S. training for developing country personnel, Congress should commission a study by the Congressional Research Service or the Office of Technology Assessment to identify natural resource and environmental training activities by all U.S. agencies.

Overview hearings should be held by relevant Congressional committees to assess the training programs under their jurisdictions. The Committees, through report language or legislative language where appropriate, should promote the development of programs along the lines suggested below. Overall, the Committees' efforts should serve to provide focus and direction to training programs.

Congress should also encourage the World Bank to increase the effectiveness of its Economic Development Institute by incorporating a component to provide training in environmental and natural resource planning. (This recommendation is included as part of the multilateral development bank recommendation.)

The following suggestions cover both governmental and non-governmental training programs in the United States and in targeted countries. They are based on the premise that the people in developing countries involved in environmental and natural resources management and development efforts must draw on their own experiences but that they also can and should benefit from the experience of other developing and developed nations facing similar challeneges.

Training initiatives must be broad in scope, reaching each of the key groups, from national leaders to local people. In addition, training must not ignore the need to strengthen the management and administration of resource management programs to ensure that properly trained technical personnel can function effectively.

Regional Training Institutions: The United States should strengthen the capability of existing regional training centers, or institutions acting as regional training centers, beginning with an assessment of their distribution and scope of current programs and their capacity for expansion. Efforts should be directed at enhancement of staffing, facilities and curricula, including courses in natural resource management, applied or on-farm research programs and renewable resource education programs focusing on the economic value of the natural resources. Regional approaches to educational programs involving common resources must be encouraged. Opportunities for extended participation by U.S. resource managers and other professionals in regional training programs should be facilitated.

National and Local Training Programs: The United States should foster the development of national and local training opportunities in natural resource management in developing countries. This can be done by ensuring that national training institutions train natural resource instructors and professors and that they receive support for training of field personnel. In addition, a much greater effort needs to be placed on the development of grassroots training programs that take the lessons of sustainable natural resource and environmental management directly to the communities and local populations. Local universities with natural science programs should be encouraged to establish departments dealing with the applied and managerial aspects of natural resource management. In order to encourage local-level training, the United States should provide funding for organizations and programs that demonstrate a potential for effective community-based training.

Overseas U.S. Research and Development: Overseas research-oriented programs conducted by U.S. scientists and managers should be designed to incorporate the training of foreign national counterparts. This also will help transfer knowledge and technology. One successful approach to achieving this objective is to develop a "twinning" program for U.S. universities and their sisters in the developing world.

U.S. Component of Training: Although most foreign national training should be at in-country or regional programs, U.S.-based training programs also should be expanded and strengthened. This will require an assessment and selective enhancement of existing university curricula and other structured training programs administered by government agencies, NGOs and other private entities.

In addition, short-term, field-oriented workshops can provide unique opportunities for foreign resource managers to gain exposure and develop widely varied skills. But they must be appropriately tailored to issues and opportunities of relevance to their countries. The length of these short courses should be from a few weeks to a couple of months. Longer programs may be counterproductive, due to the "brain-drain" effect on Third World environmental institutions. Agencies like the Environmental Protection Agency, the Park Service, the Forest Service and the Fish and Wildlife Service are appropriate U.S. hosts for such courses. Some of these agencies already provide programs for U.S. personnel which could be modified to include Third World participation at minimal cost. Fulbright scholarships and other private initiatives also can provide this valuable U.S. short-course opportunity for interaction between U.S. and Third World environmental personnel.

Longer-term opportunities for foreign resource managers to work side-by-side with U.S. resource managers should be encouraged. Enhanced scholarship opportunities in U.S. universities will facilitate training of foreign nationals and information exchange with U.S. resource managers.

Project-Specific Assistance By U.S. Personnel: Technical personnel from EPA and other agencies should be available to be sent to Third World countries for periods of a few weeks to work with local officials on specific projects or problem areas at their request. Despite the need for budget restraint, these efforts, if focused, carefully selected, and of short duration, can be a very cost-effective way to transfer technical and practical knowledge and help developing country personnel become self-sufficient.

Recommendation 7: Strengthen Peace Corps' Environmental Focus

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Congress should direct the Peace Corps to strengthen and expand its forestry and natural resources sector.

Background

Approximately 10 percent of all Peace Corps volunteers are currently working on environmentally related projects. Approximately 70 percent of these projects are forestry oriented (for example, developing and managing tree nurseries in local villages), and about 30 percent have a broader environmental aspect (for example, park planning, wildlife management or environmental education).

Overall, however, the Peace Corps' environmental program is limited by the lack of an institutional focus within the agency. The Peace Corps does not employ a single permanent employee to coordinate its environmental projects. One of the two people in charge of the forestry and other natural resource-related activities is on loan to the agency from the U.S. Park Service and the other is funded by the Agency for International Development. In addition, it is likely that the Peace Corps will not have the capacity to fill the demand for natural resource specialists in the next few years, due to a shortage or declining enrollment of foresters or natural resource specialists and an increasing number of requests for forestry volunteers. Over the past few years, the agency has been able to respond to approximately 70 percent of the formal requests for environmental assistance, primarily for forestry-related projects, from developing countries.

A congressional directive to strengthen the Peace Corps' forestry and natural resources sector would enable the agency to play an expanding role in addressing the environmental and natural resource needs in the developing world. A policy directive would allow the agency to expand already successful -- but very limited -- programs dealing with environmental education, wildlife management and park planning. The forestry program could also be expanded to meet the current demand for forestry volunteers. Peace Corps volunteers could be particularly effective in promoting environmental awareness at the grassroots level through their unique involvement with the rural and lower income populations -- the groups likely to suffer most from environmental mismanagement.

As part of its strengthened environmental mandate, the Peace Corps should play an expanded role in addressing human health-related problems through better environmental management practices. The Peace Corps is already involved in projects such as water purification and sewage treatment. It should consider providing the technical expertise to developing countries in air pollution control and solid and hazardous waste management techniques.

A strengthened and expanded environmental program would enable the Peace Corps to respond to the growing congressional interest in addressing the long-term environmental and natural resource needs of developing countries. The Peace Corps has already been indentified as a key implementing agency in legislation (H.R. 2782) introduced by Congressman Benjamin A. Gilman to authorize $75 million for small-scale projects to restore the resource base and promote sustainable growth throughout sub-Saharan Africa.

The importance of the Peace Corps as an element of U.S. foreign policy was emphasized in this year's Foreign Assistance Act reauthorization. The House Foreign Affairs Committee directed the Peace Corps, to the maximum extent possible, to double the number of volunteers from approximately 5,000 to 10,000 by 1989.

Needed Congressional Action

Congress should amend Section 3 of the Peace Corps Act by adding the following new subsection:

> "(i) In recognition of the serious environmental and natural resource problems in developing countries, the Peace Corps should strengthen and expand its forestry and natural resources sector by hiring permanent Peace Corps staff and developing a comprehensive program to address these problems."

Report language such as the following would clarify the intent of the legislative language:

> Actions needed to strengthen the environmental and natural resource effort at the Peace Corps include: hiring of permanent staff to administer the program; development of a recruiting program to attract volunteers with environmental health, pollution control and natural resource backgrounds; development

of a training program to educate volunteers about the unique environmental and natural resource concerns of developing countries; and improvement of current efforts to "backstop" (the provision of technical assistance and material support) volunteers while they are in the field.

Support from the private sector could also play an important role in strengthening and expanding the forestry and natural resources sector within the agency. The Peace Corps Office of Private Sector Development is responsible for coordinating monetary and material donations from corporations and foundations. Private sector donations could be particularly useful in "backstopping" environmental projects by providing technical supplies and expert advice to volunteers in the field.

The U.S. environmental non-governmental organizations also can contribute to the work of environment and natural resource management Peace Corps volunteers. Many U.S. NGO's are developing active international programs dealing with third world environmental issues and often are working directly with NGO's overseas. Developing country NGO's could benefit from Peace Corps volunteers' assistance in environmental education, institution building and environmental research. U.S. NGO's could "backstop" the volunteers by providing materials, contacts and technical services.

Recommendation 8: Focus Multilateral Development Bank Attention on Resource Issues

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The Congress should insure that the Secretary of the Treasury instruct the U.S. representatives to the multilateral development banks (MDB's) to oppose any project with environmental and natural resources impacts which undermine its long-term prospects for success. The U.S. representatives also should urge the MDB's to adopt the recommendations developed by the House Banking Subcommittee on International Development Institutions and Finance. Particular attention should be paid to involving recipient country environmental authorities in the banks' environmental review processes.

Background

A significant part of all international development assistance efforts is funded or carried out by such multilateral assistance organizations as the World Bank and the regional development banks. As of 1985, the World Bank's Operations Manual contains general principles pertaining to environmental and resource policies and procedures, but the level of attention actually given in program and project development planning and in sectoral assistance to these questions varies. The same is true at the other development institutions. It would be helpful, despite a lack of legal requirements for specific review procedures (as under U.S. law applying to AID and other U.S. agencies), if U.S. executive directors: (1) press for more specific and systematic MDB efforts to promote sound environmental and resource policies; (2) work to make projects consistent with recipient country environmental policies and regulations where they are sufficiently rigorous; and (3) seek to involve recipient country environmental officials and non-governmental organizations in the process.

The United States is limited in its ability to affect change at the multilateral development banks because they are international institutions run collectively by donor nations. Since the U.S. is a large contributor to the banks, however, it does have a considerable amount of influence on bank policy. The primary way Congress affects the policy at the banks is by instructing the U.S. executive directors -- through the Secretary of the Treasury -- to carry out congressionally approved policies.

Over the past year, Congress has focused considerable attention on the environmental and resource policies of these institutions. During the 98th Congress, the House Banking Subcommittee on International Development Institutions and Finance held a series of hearings to review the policies at the multilateral development banks. In December 1984, the subcommittee released a set of recommendations to improve the policies at the banks. The recommendations include actions affecting MDB staffing, training programs, the relationship of the banks with recipient countries and the U.S. Treasury Department's role in reviewing proposed MDB loans. The recommendations also provide guidance to the U.S. executive directors to ensure that bank projects incorporate sound environmental principles.

Since the release of the recommendations, House and Senate Appropriations subcommittees have incorporated some of the suggestions into appropriations bills for the banks. Senator Bob Kasten, Chairman of the Senate Appropriations Subcommittee on Foreign Operations, included language in the report accompanying the fiscal year 1985 supplemental appropriations bill urging the banks to provide for sufficient environmental staff in order to review all new and existing projects for adverse environmental consequences; modify bank policy to emphasize small-scale projects which are environmentally beneficial; and consult with recipient country governmental ministries, non-governmental environmental organizations and indigenous peoples' organizations in planning and implementing environmentally and culturallly sensitive projects.

The House Appropriations Subcommittee on Foreign Operations, chaired by Congressman David R. Obey, wrote legislative language, and elaborating report language, on these and other issues into the fiscal year 1986 foreign assistance and related programs appropriations bill.

The actions of the two Committees have put the Congress on record in support of better environmental and natural resource policies at the multilateral development banks. As of early August, some of the recommendations had been implemented, and others were being reviewed. The extent to which this activity will result in improved environmental policies at the banks remains to be seen.

Needed Congressional Action

Congress has already taken significant steps in support of improved environmental policies at the MDB's through the actions of the House and Senate Appropriations committees urging the adoption of the recommendations developed by the House Banking subcommittee.

In order to ensure that the intent of Congress is met, the House Banking Subcommittee on International Development Institutions and Finance should hold oversight hearings to determine the effect of the congressional action at the banks. If it is not satisfied with the progress being made at the banks, the subcommittee should write language into the banks' authorization bills requesting the Secretary of the Treasury to instruct the U.S. executive directors to the World Bank and the regional banks to vote against any project in its final form which results in the use of natural resources at an unsustainable level, endangers species survival, causes environmental degradation beyond recipient country boundaries, converts or degrades already overtaxed natural areas or impairs the land resource base upon which indigenous peoples depend. (The same language is contained in the report accompanying the fiscal 1986 House version of the Foreign Assistance and Related Programs Appropriations bill.) In addition, the U.S. representatives should be instructed, through legislative language in the authorization bills, which at a minimum should contain language similar to that contained in the House appropriations bill, to urge the banks to adopt the recommendations of the Banking subcommittee. Particular emphasis should be placed on the recommendation to involve recipient country environmental authorities in the bank's environmental review processes.

Recommendation 9: Expand P.L. 480 Program to Include Conservation of Biological Diversity

Congress should broaden the development goals of the P.L. 480 "Food for Peace" program to include projects for the conservation of biological diversity.

Background

Biological diversity refers to the variety of life on earth, of which more than half is contained in the tropical rainforests. Scientists have only begun to explore the plant and animal species contained within these forests to determine their potential benefits to modern society. The abundant genetic resources of the forests, combined with the potential results of research in the genetic sciences, could lead to significant breakthroughs in fields such as agriculture, foresty and medicine.

In the agricultural field, new technologies must be developed to withstand the demands of a rapidly expanding world population, and one of the most effective tools in agricultural development is genetic manipulation. The centers of origin of many food plants are located in the tropics, and as tropical lands are converted for human use, the ancestral stocks of these plants are jeopardized or lost. Only three species -- corn, wheat, and rice -- produce two-thirds of the world grain crop. The food supply of the entire world depends on maintaining plant resistance to pests and disease, and resistance is usually restored or maintained by cross-breeding with wild populations of the same species. Several domesticated food plant varieties have become extinct and many more are seriously threatened because they have not retained the genetic variability found in wild populations. The gene for semi-dwarfism that greatly improved Asian rice production came from a primitive Taiwanese wild donor species in India's Silent Valley region -- an area currently under severe pressures of development.

The susceptibility to pests and disease, which is greater in modern agricultural systems because of large monocultures, was well illustrated by the catastrophic failure of corn production in the U.S. in the early 1970's. A leaf blight eliminated one-seventh of the entire crop, and as much as one-half of the crop in the southern U.S., resulting in losses of over $1 billion. Blight-resistant strains of corn, derived from wild relatives in Mexico, were used to save this crop.

Many scientists believe that the immense genetic resources of the tropical forests will be lost if the rapid deforestation and inappropriate settlement practices in tropical countries continue at their present rate.

P.L. 480: A current USDA report shows that P.L. 480 "Food for Peace" program operates in 33 countries around the world, including tropical countries with rainforests such as Peru, Costa Rica, and Honduras -- key areas for biological diversity conservation projects. This recommendation proposes an extension of the United States' P.L. 480 program to include conservation of biological diversity as one of the goals of its development program.

P.L. 480 essentially operates through three different titles, all of which have a development objective. Titles I and III make commodities available at concessional (below market) rates with long-term, low-interest financing for debts incurred. Recipient countries resell the U.S. commodities and are required by contract to apply part of the currency generated to "self-help" (i.e. development) projects agreed on by the country and by the AID mission in that country. In the case of Title III, the country can eventually cancel its debt by applying equivalent funds to long-term development projects. Title II of P.L. 480 provides U.S. commmodities to developing countries in case of emergency or to be used in nutrition and development programs. The Title II "Food for Work" program has conducted reforestation and resource management projects in which laborers are paid with food or wages generated from the resale of U.S. commodities.

P.L. 480's budget comes out of USDA's budget. Thus, its basic development objective is to increase agricultural productivity. In recent years, however, this objective has included long-term programs with goals such as improving the health, nutrition and literacy of the rural poor; introducing population control programs; improving soil and watershed conservation; and expanding the agricultural research facilities of host nations.

The Link Between Biological Diversity and P.L. 480: The conservation of biological diversity would be a logical extension of the P.L. 480 program, due to the strong link between biological diversity and agriculture, particularly in the area of agricultural research. The technical advances that are possible using the genetic resources of the forests will not come about without a considerable investment in agricultural research and education. All three titles of P.L. 480 could be applied towards the conservation effort. Title III might be particularly useful in funding long-term research projects and has the added attraction for developing countries of debt forgiveness.

Sound, multiple-use land management reform is an important aspect to conserving biological diversity. One of the best measures of proper land usage is how well an area retains its biological diversity after being developed. Many deforested areas in the tropics are unable to support cultivation and become barren grasslands, barely able to support cattle, in only a few years after development. P.L. 480 funds could be used in projects, such as multiple-use planning projects that promote an environmentally sound approach toward land usage in tropical countries. P.L. 480 funds could also be used to establish conservation areas, which would become centers for research in biological diversity. P.L. 480 should not be used for a project which would counter conservation efforts.

Needed Congressional Action

P.L. 480 funds are already used to finance programs which indirectly promote the conservation of biological diversity, including forestry projects and projects which promote agricultural productivity and thus relieve the need for new development and settlement in forested areas.

Congress should add a specific mandate in the P.L. 480 authorization act (the Agricultural Trade Development and Assistance Act of 1954) that would allow P.L. 480 funds to be used for projects which directly promote the conservation of biological diversity, such as land acquisition, research and land management activities.

Title I, section 109 of the act could be amended by adding the following language in a new subsection (12):

> (12) promoting the conservation and study of biological diversity.

Adding language to this section would amend all three titles of P.L. 480.

The intent of the language would be clarified in report language such as the following:

> Titles I, II, and III of P.L. 480 are amended to allow P.L. 480 funds to be used more widely for biological diversity conservation projects. Projects should include: 1) research on threatened or critical ecosystems and species, especially

> in tropical developing countries; 2) establishment of national conservation data centers to determine conservation priorities and to review environmental impacts of development projects; 3) development of national conservation strategies; 4) identification of areas of high species diversity, areas of high species endemism, and centers of origin of important crop plants; 5) acquisition of biologically important lands to establish parks, agricultural reserves or other types of conservation units; 6) training of foreign nationals in conservation biology and natural resources management; and, 7) public awareness campaigns involving local and international non-governmental organizations, to promote the conservation of biological diversity.

In addition, other initiatives have been introduced to conserve biological diversity, including H.R. 2957 to protect tropical forests in developing countries and H.R. 2958 to protect biological diversity, by Congressman Gus Yatron, Chairman of the House Foreign Affairs Subcommittee on Human Rights and International Organizations and a member of the Developing Country Task Force. Companion legislation will soon be introduced in the Senate by Senator William V. Roth, Jr. These measures merit serious attention. This legislation follows up on the initiative of Senator Claiborne Pell, Ranking Minority Member of the Senate Foreign Relations Committee and a member of the Developing Country Task Force, enacted into law in 1983 as Section 119 of the Foreign Assistance Act. The lead sponsor in the House was Congressman Don Bonker, Chairman of the House Foreign Affairs Subcommittee on International Economic Policy and Trade and also a member of the EESI task force.

Recommendation 10: Review Options for Using Foreign Debt to Encourage Sustainable Development

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In addition to P.L. 480, Congress should investigate the broader debt situation in developing countries to assess the feasability and desirability of cancelling or rescheduling part of the debt owed to the U.S. government in exchange for developing country efforts to undertake environmental and natural resource projects which will improve the long-term prospects for sustained growth and debt repayment. The Congress also should review potential incentives to encourage private sector commercial banks in the United States to reschedule or forgive portions of their loans in exchange for similar environmental or natural resource projects. In addition, the policies of the International Monetary Fund that may result in environmentally unsustainable development should be examined.

Background

The foreign debt situation is a serious and steadily worsening problem for the United States and the developing world. Sub-saharan Africa, already struggling against severe conditions of drought and poverty, is $60.3 billion in debt, primarily to "official" (i.e. foreign governments and their agencies) creditors. In Latin America, Brazil alone owes $100 billion of the total $357.1 billion debt for that region. The problem has been compounded in recent years by a decline in the gross national product of many developing counties, which has resulted in a decreased ability to service the debt.

The foreign debt load takes scarce capital away from economic development, undermining the developing countries' long-term ability to grow, and repay the debt.

David Rockefeller, in a September, 1984, speech to the American Bankers Association International Banking Policy Forum, said that he is "convinced...that general economic growth is the key ingredient to alleviating the staggering weight of the current debt situation" and that "foreign assistance has played and should continue to play an absolutely essential role" in attaining economic growth. He also emphasized the "need for substantially increased aid from the industrialized nations, including especially the United States, to the developing nations of the world" and urged the banking community to become involved in this effort both for humanitarian reasons and for its own self-interest.

Environmental problems in develping countries are directly linked to economic instability, due to the heavy dependancy of developing economies on their natural resources. Rockefeller mentioned this connection in his speech:

> Just as our world is increasingly interdependent, so are its problems. Health, hunger, overpopulation and economic stagnation are all complexly intertwined. Our air and our oceans recognize no borders, and your neighbors' acid rain or pollution is soon your own. Faced with desperate poverty, nations will, understandably, do almost anything to survive -- even if this involves decimating their natural resources and the environment. Given the fragility of our planet's ecosystem, poverty that forces such actions is to the final detriment of us all.

Debt rescheduling or forgiveness could be used to promote the economic growth so necessary to alleviating the international debt problem and at the same time augment the developing countries' environmental and natural resource programs. Debt rescheduling or forgiveness could be used as an incentive for a developing country to undertake needed environmental and natural resource management projects in, for example, soil conservation, dune-stabilization, tree-planting or through protection of globally strategic areas in which all nations benefit. Other kinds of projects may include the creation of alternative employment opportunities for people dependent on fragile ecosystems. By conserving and restoring the resource base upon which development depends, such projects will contribute to long-term growth, and eventually strengthen a country's ability to repay its debts.

Money owed to the U.S. government by developing countries was originally loaned through bilateral agreement under one of several acts such as the Foreign Assistance Act, the Export-Import Bank Act or the Agricultural Trade Development and Assistance Act (P.L. 480). Nearly all of the non-military money owed under the Foreign Assistance Act is in loans made by the Agency for International Development. AID is already involved in environmental and resource management projects, and therefore it seems appropriate that forgiveness or rescheduling of AID debts could be used to promote such programs.

AID is now required to stop funding to countries who are in arrears on their AID debts for more than one year. Debt forgiveness or rescheduling of AID loans would therefore alleviate the immediate pressure to repay the loans, without causing a country to lose its AID funding.

There are several basic obstacles to AID debt rescheduling and forgiveness. First, there is no precedent for AID offering to reschedule or forgive its loans. Also, section 620 (r) of the Foreign Assistance Act (the Dirksen amendment, added in 1966) effectively bars the conversion of past loans into grants. And last but not least, forgiveness and rescheduling have budgetary implications which require serious consideration.

In addition to the money owed to the U.S. government, developing nations are deeply in debt to U.S. commercial banks. Debt forgiveness or rescheduling cuts into bank profits, making it necessary to consider appropriate governmental financial incentives. Already, U.S. banks and corporations can receive tax breaks for donating currencies they own, but which are frozen by foreign countries, to those countries.

Needed Congressional Action

Congress should commission a study that examines the foreign debt situation and the feasability of applying debt forgiveness and rescheduling in exchange for developing country efforts to promote long-term environmentally sustainable development. The study should take into consideration both public and private debt and should consider ways that the U.S. government can offer incentives to commercial banks for forgiving or rescheduling portions of their loans to developing nations. The study should also examine whether the International Monetary Fund is inadvertently encouraging environmentally unsustainable development through conditionality agreements and otherwise.

Recommendation 11: Review International Natural Resource Programs in U.S. Agencies

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Congressional environmental and natural resources committees should exercise their oversight authority to review what agencies under their jurisdiction are now doing to provide assistance to developing countries on environmental and natural resource issues and to consider expanded assistance.

Background

In addition to agencies with specific international mandates, such as the Agency for International Development, numerous domestic agencies could make substantial contributions to international resource and environmental needs in developing countries. These include the National Park Service, Fish and Wildlife Service, Environmental Protection Agency, Army Corps of Engineers, U.S. Forest Service, National Oceanic and Atmospheric Administration, Department of Energy and many others.

Many of these agencies already are assisting developing countries with agricultural, park, environmental and other concerns. The National Park Service, for example, has had bilateral agreements with some developing countries to provide technical assistance -- for which the service has been reimbursed -- on setting up national parks. Most such agencies, however, do not have a specific mandate to develop and use their expertise in an international context.

In general, congressional committees have not addressed the international activities of agencies under their jurisdictions. Moreover, there has not been a thorough assessment of what the U.S. government is currently doing -- or what it might potentially do -- to share our expertise in environmental and natural resource management with developing countries.

In an effort to help congressional committees identify the international environmental and natural resource activities under their jurisdiction, Representative John F. Seiberling has asked the Congressional Research Service to conduct a review of congressional hearings and bill referrals on international environmental issues.

As an example, the House Interior Subcommittee on Public Lands, chaired by Representative Seiberling, is holding oversight hearings to assess the international activities of the agencies under its jurisdiction. The goal of the hearings will be to find out what these agencies are currently doing, as well as what they can potentially do, to help address the environmental and natural resource concerns in the developing world. The hearings will also be used to determine if there are any legal impediments to what the agencies can, or should, be doing in developing countries.

Needed Congressional Action

Congressional environmental and natural resources committees -- such as the House Committees on Agriculture, Energy and Commerce, Interior and Insular Affairs, Merchant Marine and Fisheries and Science and Technology and the Senate Committees on Agriculture, Nutrition and Forestry, Energy and Natural Resources and Environment and Public Works -- should conduct oversight reviews -- such as formal hearings, informal briefings and other appropriate oversight activities including staff investigations, Congressional Research Service reports and General Accounting Office reports -- to identify the international activities under their jurisdiction. Where appropriate, committees should identify legislative and administrative actions to further these activities. The committees should also make recommendations for improving the access by developing countries to pertinent information and should encourage relevant agencies to work with the U.S. AID in making this information available to developing countries that request such assistance.

Recommendation 12: Incorporate Natural Resource Assessments Into Project Cost/Benefit Analysis

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Congress should take action to incorporate environmental and natural resource considerations into basic cost-benefit analyses of development assistance projects. This action should include: (1) identification of significant "natural resource accounting" methodologies available for use in cost-benefit analyses as well as identification of obstacles to their use; (2) a directive to U.S. AID to establish model development projects using such methodologies and (3) a directive to the Treasury Department to instruct the U.S. executive directors to the multilateral development banks to urge inclusion of environmental considerations in project development at the cost-benefit analysis stage.

Background

Despite impressive policies incorporating environmental and sustainable natural resource management concerns into economic development projects, leading development agencies such as the World Bank, other multilateral development banks and U.S. Agency for International Development continue to have difficulty in implementing such policies. One major problem appears to be that the professionals who plan for such projects are not trained to use methodologies that would take into account environmental and natural resource factors in basic cost-benefit analyses. Another problem is that most development planning still addresses environmental concerns only after economic analyses -- and basic decision-making -- have been completed.

The solution to these problems involves reaching deep into the development agency organization and addressing its most basic operations. But this is something that is difficult for policymakers in Congress to address and is achievable mainly through relatively indirect methods and continuing pressure for change.

The economic drawbacks of neglecting environmental concerns are very clear in hindsight. Projects fail, wasting scarce financial resources. Deforested areas have caused dams to silt up and become unusable. Over-use of pesticides have caused health and productivity problems. As much productive land is estimated to be lost each year as is gained through new irrigation. The list of preventable negative economic consequences due to failure to factor in environmental concerns is long.

Conversely, environmental and natural resources present opportunities for development which can be missed if they are not considered.

Partly as a result of observing such consequences, and partly as a result of public pressure or lawsuits, most development assistance agencies have established policies that state that environmental and natural resources factors will be considered as part of the process of assisting economic development. The World Bank and the other major multilateral development banks formed in 1980 a Committee of International Development Institutions on the Environment (CIDIE). The World Bank has an office charged specifically with environmental oversight of its projects. U.S. AID requires that environmental concerns be included among the many factors that must be considered in planning all projects. AID also has an environmental officer for each major region and a designated environmental official in each AID mission. However, the weaknesses of these measures have resulted in their failure to meet their objectives.

The World Bank office charged with environmental oversight is understaffed. They have developed a number of useful guidelines for use in planning projects, but they must be highly selective and can only "go to bat" on a very few projects each year to get substantial amelioration of negative environmental impacts.

In the case of AID, the agency is definitely in the forefront of international development assistance agencies. But few of the designated environmental officials in missions have the necessary training to properly assess possible negative environmental consequences and positive opportunities. Although AID has increased the number of projects designed specifically to deal with natural resource management, such as reforestation efforts, the process for identifying environmental consequences that may make certain types of projects unsustainable and uneconomical works primarily as an add-on to the basic cost-benefit analysis. In too many cases, environmental assessments come too late in the process to be useful or, in some cases, they may not be done at all.

Given that there are very real and measurable economic costs to negative, unforeseen environmental consequences, it appears necessary to go beyond the existing policies and relatively ineffective measures currently in use in order to assure that these consequences are factored into decision-making where it really counts -- when benefits and costs are analyzed.

Extensive literature exists on incorporating environmental considerations into economic analyses. Attention focuses on two aspects: (1) methodologies for quantifying the value of all natural resources affected by a project and (2) examination of the longer-term consequences of impacts which are often hard to identify. Despite this extensive literature, however, these metholologies are seldom used in projects' economic analyses.

Congress has acted in several instances to demonstrate its intention that environmental consequences should be carefully factored into development planning. In 1981 and 1983, amendments to the Foreign Assistance Act were passed to assure environmental factors would be taken into account. Over the past two Congresses, numerous hearings have focused on the environmental activities of U.S. AID and the multilateral lending institutions. As a result of these hearings, and subsequent pressure from Congress, the U.S. representatives to the World Bank are placing increased emphasis on environmental aspects of proposed projects, and AID reinstated its career path for natural resources management.

It is becoming apparent that if the conceptual framework used in basic cost-benefit analysis is not constructed to include enviromental or social factors, adding them on later rarely has an impact on the project. If the intention of Congress expressed in the laws that have been passed and the hearings held on these issues is to be addressed, an examination of these basic analytical tools will be necessary, together with development of methods of encouraging use of methodologies that will include the environmental factors.

A word of caution is appropriate. Improved cost-benefit analysis can only go so far in evaluating environmental and natural resources factors. Some simply cannot be completely quantified, and this limitation should be fully recognized.

Needed Congressional Action

While various methodologies to incorporate enviromental and natural resource concerns into economic analysis have been developed, there is a great need for both better sharing of information on these methodologies and for their rapid incorporation into project development. Congress should therefore convene a workshop or other from of inquiry, possibily through the Congressional Research Service or the Office of Technology Assessment, that would bring together the relevant professionals from major development agencies with experts who have formulated appropriate methodolgies for the following purposes:

1) To assess the methodologies that offer promise in incorporating environmental and natural resource factors into economic evaluations of development projects.

2) To identify major obstacles to their use, and ways to overcome these obstacles.

A report based on findings of the workshop should be used by relevant congressional committees to require better incorporation of environmental factors in planning for sustainable economic development.

The Congress should also require AID to use the expertise available in natural resource economics to apply some of the methodologies available to a small number of projects as models of environmentally sound project analysis. AID would become a laboratory for evaluating the effectiveness of the most promising techniques available. Congress should fund a small grant to U.S. AID to assist in this project.

Finally, Congress should direct the Treasury Department to take steps to further the inclusion by the MDB's of environmental considerations in project development at the cost-benefit analysis stage.

Recommendation 13: Support the United Nations Environment Program

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Congress should continue to support -- at the current level of funding -- the United Nations Environment Program.

Background

The United Nations Environment Program (UNEP) was created as an implementing secretariat after the United Nations Conference on the Human Environment, held in 1972 in Stockholm, Sweden. It is an independent agency of the United Nations family and is funded by voluntary contributions from member governments. It is governed by a council of 58 nations representing the regions of North America, Latin America and the Caribbean, Europe, West Asia, Africa, Asia and the Pacific. UNEP is based in Nairobi, Kenya - the first U.N. agency to be headquartered in a developing country.

Among U.N. agencies, UNEP serves as an advocate for the protection of the environment and natural resources and encourages the integration of environmental criteria in development projects to avoid unnecessary economic and social costs. It is due largely to UNEP'c catalytic role that over 110 nations now have national environmental agencies.

Although UNEP should continue to improve the effectiveness of its programs, it has made an immense contribution to the protection of our global environment. Some of its most notable accomplishments include: the first World Industry Conference on Environmental Management, hosted by the French Government in November 1984; the establishment of a worldwide International Registry for Potentially Toxic Chemicals; the establishment of Global Environment Monitoring System (GEMS) to develop methods to store, retrieve and analyze natural resource data; and the development of a regional seas program whereby more than 100 coastal nations sharing common coastal waters have begun the difficult process of creating common calibrations in monitoring coastal water pollution. UNEP is also working to strengthen international law by reviewing the International Environmental Impact Assessment Treaty authored by Senator Claiborne Pell.

The EESI task force identified U.S. support for the United Nations Environment Program as a priority recommendation at its first meeting. As a result, Congressman Gus Yatron, a member of the task force and Chairman of the House Foreign Affairs Subcommittee on Human Rights and International Organizations, introduced H. Con. Res. 158. The resolution is designed to prevent destructive cuts in UNEP and ensure its effectiveness by urging continued and stable U.S. support.

Needed Congressional Action

Members should co-sponsor and Congress should pass, H. Con. Res. 158, "Concurrent resolution in support of the United Nations Environment Program." In addition, the Congress should continue to appropriate the $10 million annually that is specified in the resolution. The resolution states:

> That it is the sense of the Congress that the United States Government, in its endeavor to enhance the capacity of developing societies to become self-sufficient, to mitigate the effects of drought and starvation and lessen human misery, to encourage the wise use of natural resources, to preserve the health of environmental systems, to promote global peace and security, and to gain more benefit from United States foreign assistance programs, should maintain the level of its contribution to the United Nations Environment Program at no less than the amount of its 1973 contribution ($10 million).

Appendix A

Foreign Advisory Group

Developing Country Project

Dr. Mostafa K. Tolba
Executive Director
United Nations Environment Programme
Nairobi, Kenya

Mr. Kasem Snidvongs
Deputy Permanent Secretary
Ministry of Science, Technology and Energy
Bangkok, Thailand

Dr. Paulo Nogueira-Neto
Ministerio do Interior
Secretaria Especial do Meio Ambiente (SEMA)
Brasilia, Brazil

Professor Wangari Maathai
Chairman, National Council of Women of Kenya
Nairobi, Kenya

Ms. Margarita de Botero
Directora de Asuntos Internacionales
Instituto National de los Recursos Naturales y del Ambiente
Bogota, Columbia

The Honorable Jimoh Omo-Fadaka
Chairman
Global Meeting on Environment and Development (NGOs)
Environment Liaison Centre
Nairobi, Kenya

Dr. Anil Agarwal
Centre for Science & Environment
New Delhi, India

His Excellency Emil Salim
Minister of State for Population Policy and the Environment
Jakarta - Pusat, Indonesia

Mr. Nay Htun
Director and Regional Representative
United Nations Environment Programme
Bangkok, Thailand

Dr. Marc J. Dourojeanni
Faculty of Forestry
University of Toronto
Toronto, Ontario
Canada

Madame Jacqueline Ki-Zerbo
Comite Ineretat de Lutte Contre Secheresse au Sahel
Dakar, Senegal

Dr. Abdulbar Al-Gain
Vice President
Meteorology and Environmental Protection Agency
Jeddah, Saudi Arabia

Dr. Edward S. Ayensu
Bethesda, Maryland 20817

Dr. T.N. Khoshoo
Secretary of the Environment
Department of the Environment
New Delhi, India

Mr. Frederick A.B. Meyerson
Gibson, Dunn & Crutcher
Washington, D.C.

Ms. Rosalea Hamilton
Bronx, New York

Mr. VALENTINE. Thank you very much, Doctor.

We have a recorded vote on approval of the Journal, and we'll have to go. Well, I'm sure you'll have opportunities to further express yourself in connection with answers to questions.

So we'll be in recess for 15 minutes. Thank you.

Dr. SPETH. Thank you.

[Recess.]

Mr. VALENTINE. The subcommittee will please come to order. The subcommittee will please be in order.

Our chairman, I'm the pretender. The chairman is back with us, and I would like to recognize Hon. James Scheuer at this time, chairman of this subcommittee.

Jim.

Mr. SCHEUER. Mr. Chairman, you're doing very well. I'm grateful for your taking over.

[Off the record.]

Mr. SCHEUER. I have had marvelous reports of the job you've been doing. Please continue.

Thanks for recognizing me.

Mr. VALENTINE. Thank you, Mr. Chairman.

Mr. SCHEUER. I would ask unanimous consent to revise and extend my remarks at the opening of this hearing, just before the witnesses commence their testimony.

Mr. VALENTINE. Without objection.

Doctor, I have here a series of prepared questions, but rather than to read them or try to ask most of them, I want to ask you this question which I believe—which is a matter that's been much on my mind and, I think, other Members of Congress. I have not heard anybody who is elected to the U.S. House of Representatives make a statement which indicated that he or she was opposed to our Nation holding out its hand to these suffering—to these our suffering brothers in Africa and other parts of the world. I have heard expressions of concern, which to some extent I share, as to how we go about it. Perhaps there has been some publicity of this kind which I have missed, but I have not seen anywhere, in any newspaper or on television or radio, any requests or plea for assistance from the government in Ethiopia, for example. Not that we need to have that to help them. We can send aid to our neighboring friend, Mexico, in its hour of need and have the faith—we can have almost certain knowledge that it will get to the people who need it.

How do we pierce the shield set up by what apparently is an uncaring government? How do we get through those bureaucrats? How do we get through that shell of indifference and get down to these people with our private and our governmental funds?

Dr. SPETH. Mr. Chairman, I'm best qualified to address the questions of long-term remedial measures and the types of things that we can do to prevent crises like this from happening in the future.

Mr. VALENTINE. Yes; but don't we have the—it goes to the same problem, though.

Dr. SPETH. I think it—and in that context I can tell you that there's been a rather dramatic reversal of opinion about the need to attend to these issues on the part of Third World leaders during the past decade. When environment and resource management and population issues were first pushed onto to the international agenda 10, 15 years ago, there was—numerous Third World leaders saw these as threats to their development and adopted a basically negative posture. Today, we have a dramatically different situation with a group of world leaders, including Prime Minister Ghandi, announcing strong support for population measures. We have a new group of parliamentarians for the environment working in the Third World on these resources issues where environment and development are so closely linked.

On the panel that Claudine and I served there was an international—we did not want to develop the 13 recommendations for this Congress without paying attention to the—to what people in the Third World would think about. We established a distinguished international panel of representativces from the Third World. It's an outstanding group included in the back of the report. And to a person, we got strong support for these 13 recommendations from developing country leaders.

So I think in this question—this area of how do we do development for food production and fuelwood production which 70 percent of the poor—which is 70 percent of the energy used in the poorer countries, how we do these things? There has been a growing consensus in the Third World that there's a constructive role for institutions like this Congress to play, and we know a lot more about how to do these things today than we ever did in the past. So I think there's been a real turnaround.

I'm not prepared, and I don't know, and I'd be really over my head and out of my field if I tried to address the politics in Ethiopia.

Mr. VALENTINE. Most of us would.

Well, one more question. Do you, Doctor, is there more, in your opinion, that U.S. agriculture—that the U.S. agriculture research community could be doing to help develop and evaluate low resource appropriate technologies?

Dr. SPETH. Mr. Chairman, I think that is the question, and I think there is an answer to that. And recommendation No. 5 of the 13 that our task force developed, calls upon the Congress to examine how we can use this tremendous research capability and the R&D capability in this country to meet these problems. I think with modest adjustments and some attention to the types of things that we're carrying out research on we can make this, the information, the scientific base, much more applicable to the needs of developing countries. And that would be—you know, this is—in many ways the United States has to ask itself, we're faced with a world crisis out there—population, food, resource destruction, climate change—what can we really do when we don't run these countries, to say the least?

Well, what can we do? One of the things that we do best is to produce information that can be harnessed to solving these problems. I think there is an array of emerging technologies that can make a tremendous contribution to solving these world-scale problems: technologies in energy, in pollution control, in biotech, and in computers. There is no reason the Third World has to go through the cycles of pollution and environmental degradation that we went through with our industrialization. And hopefully, if we tend enough to the problem, there can be some leapfrogging in the Third World into some of these new technologies.

Mr. **Ritter**. Will the gentleman from North Carolina yield for just a quick point——

Mr. **Valentine**. Yes.

Mr. **Ritter** [continuing]. Relating to his point?

I think you're correct that you can make major advances. But how can you, and I'd like your opinion on this. If you don't have the ability to solve the problem, it's still—I think your opinion would be valuable. How can you really make a dent in some of these food production problems when the economic organization of agriculture is ideological, it is virtually unworkable where you see figures of agricultural output declining over the decade when they for all intents and purposes should be rising? How do you make a dent in the overall figures when the system is set up to fail?

Ethiopia is a real good example.

Dr. **Speth**. Well, I think there are a lot of things that we do know how to do, and we've made a number of recommendations in our testimony, and I think you hear it in other people's testimony here, of new approaches on the ground that can work: village level approaches, approaches that take into account the role of women in the societies, smaller scale, appropriate technology approaches. I think that there's been—I was speaking, and I'd hate to sort of invoke this, bring someone else into the conversation who's not here. But I was speaking with Maurice Strong, the head of the Emergency Relief Operation for the U.N. Development Programme for Africa recently. He has been at a number of meetings with African development and trade ministers—not the environmental ministers, but the trade ministers, the development ministers, the agricultural ministers. He says that the amount of interest in—that has grown in the new approaches to agricultural production and new sensitivity to the resource base, and a new desire to turn back to seeing how much production can be done with traditional systems and how to increase the productivity of traditional seasons. That all of this has—that he sees dramatic changes in those areas.

Mr. **Ritter**. Thank you for yielding, Mr. Chairman.

Mr. **Valentine**. Yes. Thank you.

Mr. **Scheuer**. Will the gentleman yield?

Yes, Mr. Chairman?

I had a hiatus in my congressional service from 1972 to 1974, regrettably. I take no responsibility for anything the House did during those 2 years. And Maurice Strong—Maury Strong, who is head of the UNDP, asked me to visit a number of developing countries and UNIDP, in Geneva—the United Nations Industrial Development Programme—to see whether we couldn't achieve some consensus on development programs in the developing world that weren't environmentally degrading. And at that time there was an absolutely unanimous consensus in the developing world that the whole concept of environment and the sensitivity to environment coming from the United States, and a few other developed countries was a put-on and a put-down to the developing world that was designed to make development more expensive, less cost effective from their point of view, and to retard their development. And in effect, they told me: you go tell Maurice Strong and the rest of your fancy friends in the developed world that we need development and we'll accept those smoky skies and polluted waters as the price tag for development. Our environmental problems are the starving kids, disease-ridden kids, illiteracy, despair, hopelessness. Those are the environment problems that plague us.

Well, I'm delighted to hear that Maury Strong now feels that in the decade since then there's been a turnabout in the developing world and that they're willing to accept some footnotes on development, or asterisks on development that says: yes, development is good, you need development; but it must be done in a way that won't degrade your land, that won't degrade your resource base, that won't degrade your air, your water, that will leave you with a planet with an environment that is one you want to raise your kids and grandchildren in.

If they have made progress along those lines in the last 10 or 12 years, it's a wonderful thing. I just want to express my delight at Maury Strong's recent report, because it's at great variance with the realities as they existed a decade ago when we made intensive efforts to sensitize the developing world countries on the question of environment, and where we were met with suspicion, indifference—indifference at the best and suspicion and hostility at the worst.

Dr. **Speth**. Mr. Scheuer, I think there has been great improvement. I never claimed that we were there yet, however.

If I could mention to the committee at this point one of the other recommendations in the Environmental and Energy Study Institute report, which I think you'll be particularly interested in. One of the recommendations calls for an investigation of the linkages between the debt crisis in the Third World and the questions of sustainable production and resource management in the Third World. I think if you look at what's happening—let's look at what countries do to try to meet the debt crisis. They increase exports. This means more cash crops, more forestry exports, things of this type. They try to decrease imports. That means they don't import as much oil, so they use more of their natural resources to produce energy. They adopt austerity measures. The austerity measures reduce incomes and increase unemployment, force people back to the land. They also cut back on their new environmental and resource management agencies which have just been put in place.

So I think there are links between the debt crisis and the ability of these countries to grow and manage their resources for growth over the long haul. And that's an issue which people haven't looked at very much, and I think the Environmental and Energy Study Institute report calls for a thorough investigation of that.

If, in fact, to meet the debt payments these countries are having to destroy their futures and basically rip off their environment to do it, and rip off the resource base to do it, then perhaps some measures should be put in place to counteract those destructive tendencies. And I merely flag that as an issue for the committee, and it is one of the recommendations of our panel.

Mr. **Valentine**. Thank you very much, Doctor. And thank you, Mr. Chairman.

I will, before I recognize Representative Schneider, let me say to the members of the committee, it's going to be necessary for us to operate on the 5-minute rule. We want to give everybody a fair crack at it. And so if you would help us to that extent, members of the subcommittee, we would appreciate it very much.

Representative Schneider.

Miss **Schneider**. Thank you.

Dr. Speth, I would like to ask you two questions, and I'd like to refer to Mr. El-Ashry. One question is more political and the other more technical. The first question is along the lines that you were describing about our concern with the debt.

The reality of our—our being the U.S. Government—concern with what is going on in Africa is one that seems to fluctuate as a result of media coverage. I think there's very little question that when the starving children were on every television set in every living room there was a human outcry and mobilization of the grassroots to send support of whatever kind to the—to Africa.

However, we are looking at this problem in the long term, and I think that it is imperative that we develop a long-term strategy, not only for implementation of our technical ideas of R&D, but also the implementations of our political communication goals.

I wonder if you could elaborate a little bit, please, on the importance of the United States supporting African now in terms of seeking long-term solutions. Whether we look at Africa as a trading partner, whether it is in the United States' best interest insofar as national security is concerned, insofar as our own deficit is concerned—I wonder if you could elaborate on that, please.

Dr. **Speth**. Well, I think there are four things. First and most obviously, I think it is very important to seize this opportunity to address the longer term issues. It's a sad state of affairs where we have to move when there's a crisis and only when there's a crisis, but I think that's the situation that we face.

The United States I think has a tremendous economic and security interest in the viability of African development. When governments cannot provide for the needs of their people, governments topple. Our security interest lies in sustainable peaceful development, and when these countries can't meet their needs there's going to be trouble. There are going to be riots of some type. There's going to be extremism of different varieties. Governments will topple.

Our foreign policy interests are involved on that continent, and you get right back to the question of how do you promote sustainable development for the long run? Population—is it going to take extreme authoritarian governments to bring population issues under control in Africa, or is it going to be done benignly with a lot of forethought and in time to really make a difference? We have those choices before us.

In terms of economic trade, over a third of our trade today is with the developing world. And increasingly it can be with Africa. The really expanding markets of the world will increasingly be in the Third World. We have resources that we need in Africa. We have real economic interests in seeing sustainable peaceful, constructive development take place there.

We also have interest in preventing things, preventing tragedies like the famine in Africa now, because in the long run it's going to be a lot cheaper for us than to go in and pay the cost of neglect, as we are now doing with the relief money that's going into the famine.

And last, we will inevitably be engaged in rural development through our aid programs in Africa. And it's very important that that be done properly and that the money not be wasted on the wrong types of projects.

So I think we have an array of issues there that justify the concern of the many committees of this Congress and many constituencies in this country, and not just the people who are actually engaged in relief and development. We have economic and security interests at stake.

Miss SCHNEIDER. I wonder if you think that it is appropriate for us to put into legislation some R&D authorities. Because right now there are many different agencies that do not have research and development authorities. Do you think that this would be a technical move that would better insist the putting into action the recommendations that you've come forward with?

Dr. SPETH. Yes, I do. Yes, I do, and the panel that drafted the report would be delighted to work with you on that.

Miss SCHNEIDER. OK, very fine. My time is up I'm afraid.

Thank you, Mr. Chairman.

Mr. VALENTINE. Thank you.

Mr. Chairman.

Mr. SCHEUER. I apologize for this sort of continuing running commentary on your testimony, Dr. Speth, but I was intrigued at your tying our security interests with the ability of governments to care and feed their people and give them a modicum of acceptable quality of life.

About a year—about 2 years ago one of our topmost intelligence agencies in this country did a study of the impact of the population explosion in the developing world on our security. The conclusion of their very excellent report was exactly as you have stated. Population pressures that produce—that make it impossible for a government to provide for the basic human needs of their people as you have across the whole length and breadth of Africa, societies that are on anywhere from a 16- to a 25-year-doubling period where they can't possibly double their food output, their output of housing and health care and education and, above all, jobs. Where, in effect, population is increasing by about 3.5 percent over most of sub-Saharan Africa and food is increasing about 1 percent. You have a 2 point—2 or 3 or 4 percent cumulative deficit, annual deficit in per capita food production. This report predicted that as this food deficit grew and as governments were increasingly unable to meet the clear, basic, minimum human needs of their people as the rioting, as the violence, as the protest, as the demonstrations grew, governments would have to become perforce increasingly authoritarian, increasingly brutal in containing the violence, and that moderate centrist governments would fall by the way and be succeeded by coups of the Left and coups of the Right. It was essential for our own security interests to prevent that kind of destabilization and help these countries contain their exploding population growth rates and achieve a balance between goods and population so that they could provide for a bare minimum of basic human needs for their people.

So you are absolutely right on target with the prediction that this highest of our own intelligence agencies made several years ago.

And I only regret that they have kept the "Top Secret" stamp on it. That report by every criterion should be public. It should be part of the intellectual stream of commerce in this country. We should have been discussing it at hearings like this. You should have access to it. Other public policymakers should have access to it. I urge every single member of this subcommittee to talk to me and I'll tell you—you can have access to it over here on the Hill. It's a very, very well done report, and I'm only sorry we can't make it public.

Mr. VALENTINE. Thank you, Mr. Chairman.

Congresswoman Jan Meyers from Kansas.

Mrs. MEYERS. Mr. Chairman, I think in the interest of time I'm going to forego questions. Thank you.

Mr. VALENTINE. Thank you.

Representative Harry Reid from Nevada.

Mr. REID. No questions, Mr. Chairman.

Mr. VALENTINE. Well, Mr. Ritter, I believe that——

Mr. RITTER. No questions.

Mr. VALENTINE. All right.

Well, Doctor, thank you very much for a——

Dr. SPETH. Thank you, Mr. Chairman.

Mr. VALENTINE [continuing]. For an outstanding presentation.

Dr. SPETH. It's been an honor to be here. Thank you.

Mr. VALENTINE. Yes, sir?

Mr. SCHEUER. Mr. Chairman, I ask unanimous consent that all members be permitted an additional 12 days to submit questions in writing for this very provocative and very thoughtful witness, and for all the witnesses this morning. Time may not permit us—it certainly hasn't in this case—to present all the questions we would like. We would ask the witnesses to respond as quickly as they can, and we'll—I ask unanimous consent that the record be held open for another 12 days.

Mr. VALENTINE. Without objection, so ordered.

Thank you very much, gentlemen.

Now, our next witnesses constitute the Africa Tomorrow panel. Africa Tomorrow is an independent, nonprofit group organized by a number of entertainment personalities, by a number of Congressmen, and other concerned leaders, for the purpose of long-range solutions to Africa's food crisis.

We have with us today Mr. Ed Asner. If you gentlemen would come on around we will hear from you. Mr. Richard Dreyfuss, the chairman of the Education and Research Committee and, of course, for Africa Tomorrow. And Mr. Asner is the director of the organization. Both are well known and distinguished actors. Dr. Paul Winchell, who is director, Africa Tomorrow, a scientist, inventor, and a former ventriloquist—talk about versatility. Dr. Henry Heimlich, who is chairman of the Nutrition Committee, Africa Tomorrow. He's a physician who almost relocated in my part of the world. It's unfortunate for us that he did not. A physician, a scientist who developed the Heimlich maneuver that I hope none of us ever need.

Will you proceed in any way that you would deem appropriate? We will admit your prepared statements to the record. You may summarize if you would like or just proceed as you deem appropriate in whatever order you think is best for you.

I would ask the committee if we could hold questions until we've heard from each of these distinguished gentlemen.

STATEMENTS OF ED ASNER, AFRICA TOMORROW; RICHARD DREYFUSS, AFRICA TOMORROW; PAUL WINCHELL, PH.D., AFRICA TOMORROW; HENRY HEIMLICH, M.D., AFRICA TOMORROW

Mr. **Asner**. Thank you, Mr. Chairman. The voice you hear will be mine, though Dr. Winchell is sitting next to me. [Laughter.]

I believe our statements are fairly short. If I'm wrong, then certainly the latter speakers will have to curtail their comments. [Laughter.]

So that we won't have to summarize, we'll certainly be subject to all questions, either verbal or written.

Thank you very much for inviting us to give testimony this morning on the vital subject of nutritive self-sufficiency for the African people.

Congressman Scheuer provided us with a list of your subcommittee's members, and I'm sure from reading it that some of you don't necessarily agree with Ed Asner on issues of defense or foreign policy. But I'm gratified that we can and do agree on working together to solve the African famine crisis. My colleagues and I are honored to be here to testify to that.

With me, representing Africa Tomorrow, fellow actor and activist Richard Dreyfuss, Oscar winner; Dr. Paul Winchell—my voice—who is not only known as an actor and ventriloquist, but also as the inventor of the first artificial heart prototype, with added expertise in aquaculture and energy sources; Dr. Henry Heimlich, the longtime peace activist and surgeon, for that Hemilich maneuver which you mentioned, whose one saved victim can be numbered to be President Reagan.

Standing by to speak in the session following ours, to more Africa Tomorrow directors: Dr. James Kamusikiri, originally from Zimbabwe and our resident expert on the African people and governments, and Dr. Cynthia Irwin-Williams from the Desert Research Institute, University of Nevada/Reno, an expert on water harvesting.

If someone had taken me aside in the 1950's, when I was doing college plays in Chicago, and told me that 35 years later I would be testifying before Congress on aquaculture in Africa, I would have said baloney. To be truthful, I still don't believe it, for I'm certainly no expert on the subject.

But in February of this year, I was drafted for the cause by Dr. Winchell, who told me of tilapia fish farming. Paul was trying to find a forum for this tried and proven method of aquaculture, especially with the sub-Saharan regions in such desperate need. The two of us along with a naturalist named Arnold Newman and several of our friends became Africa Tomorrow, and intentionally jumped on the bandwagon of a so-called popular cause, the African famine. Because of their humanitarian efforts our thrust is to the future, as is your commitment, not just going for the quick-fix but for the long term, because the drought and the famine that follows will most certainly come again.

We've come a long way in 8 months. Our kick-off seminar in May was a huge success; organizations such as the Peace Corps, the heads of various university aqua- and agriculture programs, directors of funding organizations, experts in all related fields. Since the beginning, we have been spearheaded politically by Howard Berman, and have since gained the ear of others in Congress such as George Miller, Howard Wolpe, Julian Dixon, Bill Nichols, John McCain, Mickey Leland, Marty Russo, and Senators Cranston, Kennedy, Dodd, and Laxalt, and, of course, our host today, Chairman Scheuer, who was initiated into our circle by Congresswoman Claudine Schneider. We've also recruited dedicated celebrities—Richard, of course; John Ritter; Jane Fonda; Norman Lear; and others—to help add visibility to our ideas.

But perhaps our biggest cause for celebration has been the partnering of Africa Tomorrow with Auburn University and their International Center for Aquaculture. They have prepared our grant proposal and the technical plans to bring it all to reality. The proposal is ready and we have delivered it to USAID. We will also be working with the Universities of Nevada and Arizona and Clark University with our water harvesting plans.

Monday, we had a very constructive meeting with Ambassador Youssoufou, head of the Organization of African States at the United Nations. I must say we are in awe of how quickly we've been able to get to this point, but at the same time we are mindful that the momentum cannot let up.

My scientific colleagues will be telling you, ~~in~~ less rambling terms and less time than I've taken, exactly why we believe in this kind of technology, this kind of village-level approach. My particular message to you is this: there are so many causes that need our attention, and the tragedies seem to compound more quickly every year. Many of you are on committees pertaining to health, and you have been dealing with the AIDS epidemic. Others of you are probably immersed in the aftermath of the Mexico earthquake. These two pressing problems have become the popular causes today, and the African famine is not in front of the public as it was 6 months ago. But our brothers in Africa are still in desperate trouble, and will be again, and we of Africa Tomorrow are appreciative that your committee's efforts are still focused on their needs.

We are similarly committed to the ideas we bring today, to helping the African people become self-reliant. We count on your help.

And now, Dr. Winchell.

[The prepared statement of Mr. Asner follows:]

Africa Tomorrow, Inc.

TESTIMONY/EDWARD ASNER - October 23, 1985
on behalf of Africa Tomorrow

Subcommittee on Natural Resources, Agriculture Research, Environment
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THANK YOU FOR INVITING US TO GIVE TESTIMONY THIS MORNING ON THE VITAL SUBJECT OF NUTRITIVE SELF-SUFFICIENCY FOR THE AFRICAN PEOPLE.

CONGRESSMAN SCHEUER PROVIDED US WITH A LIST OF YOUR SUBCOMMITTEE'S MEMBERS, AND I'M SURE FROM READING IT THAT SOME OF YOU DON'T NECESSARILY AGREE WITH ED ASNER ON ISSUES OF DEFENSE OR FOREIGN POLICY. BUT I'M GRATIFIED THAT WE CAN AND DO AGREE ON WORKING TOGETHER TO SOLVE THE AFRICAN FAMINE CRISIS, AND MY COLLEAGUES AND I ARE HONORED TO BE HERE TO TESTIFY TO THAT.

WITH ME, REPRESENTING "AFRICA TOMORROW": FELLOW ACTOR AND ACTIVIST RICHARD DREYFUSS; DR. PAUL WINCHELL, WHO IS KNOWN NOT ONLY AS AN ACTOR AND VENTRILOQUIST BUT ALSO AS THE INVENTOR OF THE FIRST ARTIFICIAL HEART PROTOTYPE, WITH ADDED EXPERTISE IN AQUACULTURE AND ENERGY SOURCES. DR. HENRY HEIMLICH, A LONGTIME PEACE ACTIVIST AND SURGEON RENOWNED FOR HIS LIFE-SAVING INNOVATIONS, ALONG WITH THE HEIMLICH MANEUVER, CERTAINLY A LIFE-SAVER FOR CHOKING VICTIMS--INCLUDING, AT ONE TIME, PRESIDENT REAGAN.

STANDING BY, TO SPEAK IN THE SESSION FOLLOWING OURS, TWO MORE AFRICA TOMORROW DIRECTORS: DR. JAMES KAMUSIKIRI, ORIGINALLY FROM ZIMBABWE AND OUR RESIDENT EXPERT ON THE AFRICAN PEOPLE AND GOVERNMENTS; AND DR. CYNTHIA IRWIN WILLIAMS FROM THE DESERT RESEARCH INSTITUTE, UNIVERSITY OF NEVADA/RENO, AN EXPERT ON WATER HARVESTING.

IF SOMEONE HAD TAKEN ME ASIDE IN THE '50'S WHEN I WAS DOING COLLEGE PLAYS IN CHICAGO, AND TOLD ME THAT 35 YEARS LATER, I WOULD BE TESTIFYING FOR CONGRESS ON AQUACULTURE IN AFRICA, I WOULD NEVER HAVE BELIEVED IT. TO BE TRUTHFUL, I STILL DON'T BELIEVE IT, FOR I'M CERTAINLY NO EXPERT ON THE SUBJECT. BUT IN FEBRUARY OF THIS YEAR, I WAS DRAFTED FOR THE CAUSE BY DR. WINCHELL, WHO TOLD ME OF TILAPIA FISH FARMING. PAUL WAS TRYING TO FIND A FORUM FOR THIS TRIED-AND-PROVEN METHOD OF AQUACULTURE--ESPECIALLY WITH THE SUB-SAHARAN REGIONS IN SUCH DESPERATE NEED. THE TWO OF US, ALONG WITH A NATURALIST NAMED ARNOLD NEWMAN AND SEVERAL OF OUR FRIENDS, BECAME "AFRICA TOMORROW" AND INTENTIONALLY JUMPED ON THE BANDWAGON OF A SO-CALLED "POPULAR CAUSE," THE AFRICAN FAMINE.

(more)

BECAUSE OF THEIR HUMANITARIAN EFFORTS. OUR THRUST IS TO THE FUTURE, AS IS YOUR COMMITMENT--NOT JUST GOING FOR THE QUICK-FIX BUT FOR THE LONG-TERM, BECAUSE THE DROUGHT, AND THE FAMINE THAT FOLLOWS, WILL MOST CERTAINLY COME AGAIN.

WE'VE COME A LONG WAY IN EIGHT MONTHS--OUR KICK-OFF SEMINAR IN MAY WAS A HUGE SUCCESS, ATTENDED BY ORGANIZATIONS SUCH AS THE PEACE CORPS, THE HEADS OF VARIOUS UNIVERSITY AQUA- AND AGRICULTURE PROGRAMS, DIRECTORS OF FUNDING ORGANIZATIONS, EXPERTS IN ALL RELATED FIELDS. SINCE THE BEGINNING, WE HAVE BEEN SPEARHEADED POLITICALLY BY HOWARD BERMAN, AND HAVE SINCE GAINED THE EAR OF OTHERS SUCH AS GEORGE MILLER, HOWARD WOLPE, JULIAN DIXON, BILL NICHOLS, JOHN McCAIN, MICKEY LELAND, MARTY RUSSO, SENATORS CRANSTON, KENNEDY AND DODD--AND OF COURSE OUR HOST TODAY, CONGRESSMAN SCHEUER, WHO WAS INITIATED INTO OUR CIRCLE BY CONGRESSWOMAN CLAUDINE SCHNEIDER. WE'VE ALSO RECRUITED DEDICATED CELEBRITIES--RICHARD, JOHN RITTER, JANE FONDA AND OTHERS--TO HELP ADD VISIBILITY TO OUR IDEAS.

BUT PERHAPS OJR BIGGEST CAUSE FOR CELEBRATION HAS BEEN THE PARTNERING OF AFRICA TOMORROW WITH AUBURN UNIVERSITY AND THEIR INTERNATIONAL CENTER FOR AQUACULTURE. THEY HAVE PREPARED OUR GRANT PROPOSAL AND THE TECHNICAL PLANS TO BRING IT ALL TO REALITY. THE PROPOSAL IS READY AND WE ARE DELIVERING IT TO U.S. A.I.D. WE WILL BE WORKING WITH THE UNIVERSITIES OF NEVADA AND ARIZONA, AND CLARK UNIVERSITY, WITH OUR WATER HARVESTING PLANS. YESTERDAY, WE HAD A VERY CONSTRUCTIVE MEETING WITH AMBASSADOR YOUSSOUFOU, HEAD OF THE ORGANIZATION OF AFRICAN STATES AT THE UNITED NATIONS. I MUST SAY WE ARE IN AWE OF HOW QUICKLY WE'VE BEEN ABLE TO GET TO THIS POINT, BUT AT THE SAME TIME WE ARE MINDFUL THAT THE MOMENTUM CANNOT LET UP.

MY SCIENTIFIC COLLEAGUES WILL BE TELLING YOU--IN LESS RAMBLING TERMS AND LIKELY LESS TIME THAN I'VE TAKEN--EXACTLY WHY WE BELIEVE IN THIS KIND OF TECHNOLOGY, THIS KIND OF VILLAGE-LEVEL APPROACH. MY PARTICULAR MESSAGE TO YOU IS THIS: THERE ARE SO MANY CAUSES THAT NEED OUR ATTENTION, AND THE TRAGEDIES SEEM TO COMPOUND MORE QUICKLY EVERY YEAR. MANY OF YOU ARE ON COMMITTEES PERTAINING TO HEALTH, AND YOU HAVE BEEN DEALING WITH THE AIDS EPIDEMIC. OTHERS OF YOU ARE PROBABLY IMMERSED IN THE AFTERMATH OF THE MEXICO EARTHQUAKE. THESE TWO PRESSING PROBLEMS HAVE BECOME THE "POPULAR CAUSES" TODAY, AND THE AFRICAN FAMINE IS NOT IN FRONT OF THE PUBLIC AS IT WAS SIX MONTHS AGO. BUT OUR BROTHERS IN AFRICA ARE STILL IN DESPERATE TROUBLE, AND WE OF AFRICA TOMORROW ARE APPRECIATIVE THAT YOUR COMMITTEE'S EFFORTS ARE STILL FOCUSED ON THEIR NEEDS. WE ARE SIMILARLY COMMITTED TO THE IDEAS WE BRING TODAY, TO HELPING THE AFRICAN PEOPLE BECOME SELF-RELIANT. WE COUNT ON YOUR HELP. THANK YOU.

Edward Asner

--EDWARD ASNER
FOR AFRICA TOMORROW

Dr. **Winchell.** Thank you very much, Ed. I'm delighted to have made those sincere statements through you today, and you notice I didn't move my lips all through that. But I am also very grateful to be here, Mr. Chairman, ladies and gentlemen.

Since the emergence of human beings on this planet until the present day, it has taken all this time to produce a population of 4 billion people. In the year 2010 there will be 8 billion. In 2040 there will be 16 billion. The need for food is increasing at the rate of 12,000 pounds per second. This plight is worsened by the fact that in many lands agriculture cannot keep up with the incredible demand due to poor and depleted soils, extreme climates, meager seed supply at planting time, and, of course, a desperate lack of water.

We are all aware that one answer will not suffice to solve Africa's problems. Many creative approaches are needed to stem the devastation of starvation and malnutrition on a long-term basis.

But first, let me say that we at Africa Tomorrow feel that sending food to starving people is a very loving and moral thing to do. But we believe that teaching those people to raise their own food and become nutritionally self-sufficient is even more loving and moral. And today I want to discuss one unique option for feeding hungry people everywhere.

The things that make our technology unique are:

One, where other methods require the use of fresh water, ours can thrive in fresh, saline, alkaline, or even brackish water.

Two, where other solutions need nutrient rich soils, ours works exceedingly well in the worst, impermeable clay soils which cannot support conventional agriculture due to the fact that water will not drain. And

Three, where many systems require costly commercial fertilizers, ours can be sustained by free animal wastes.

With these three elements we can provide an inexhaustible chain of food supplying a total nutritional balance which, once begun, will continue in perpetuity. The only requirement after implementation is supervision, which can be easily taught to the African people.

Now, may I briefly explain the process?

Hydrological reports demonstrate that there are countless water tables not far below the surface of Africa, strategically located. However, this water is usually salty or brackish. Now, within close proximity to the villages, shallow ponds will be hand dug in the clay soil and filled with water that is pumped from underground using solar energy to electrify the pumps. Then pond number one will be fertilized and stocked with fingerlings of a very prolific fish indigenous to Africa called tilapia.

The result of water fertilization is an abundant bloom of microalgae including spirulina. Tilapia are not predators who eat their young; they are hervibores who can reach maturity by feeding exclusively upon this algae.

In tropical countries the female tilapia spawns from 300 to 500 offspring each month. The progeny are put into pond number two and grow to approximately 3 pounds in 6 months' time, then they begin to propagate. Meanwhile, pond number one continues to multiply on a monthly basis, and so on.

The amount of people to be fed determines the number of ponds needed. The result of this cycle is staggering. Each acre of water can provide up to 7 tons of fish annually. The amount of spirulina that can be harvested is likewise staggering; enough for the fish, the people and any livestock. My learned colleague, Dr. Heimlich, will define the nutritional advantages of these foods in a moment.

Summing up, there are several crops that tolerate salt water and proliferate extremely well. Indigenous to Africa are duck weeds, water sprouts, water clover, water buds. These plants are rich in carbohydrates and, when sun dried, provide a flour from which conventional bread, cakes, and other dishes can be baked.

I believe that science will ultimately solve the problems which currently beset the African Continent. But in the meantime, village-level fish farms can adequately feed the people during the bleak periods while viable technologies restore Africa's long-term productivity and increase agricultural output to that of former times.

We believe that our low-tech method will meet Africa's current need, and we are guided in our thinking by one of our directors, an African gentleman, Dr. James Kamusikiri, who constantly apprises us of African socio-politico-religious attitudes.

And last, Africa Tomorrow is vitally involved with other creative solutions to desertification, reforestation, and water harvesting in an effort to make sustained use of African rains which generally occur heavily and in short periods of time. My codirectors will testify on these systems later.

I thank you very much for giving me the opportunity to address this august body.

Now, may I present Dr. Henry J. Heimlich.

[The prepared statement of Dr. Winchell follows:]

Africa Tomorrow, Inc.

Testimony of Dr. Paul Winchell

Since the emergence of human beings on this planet until the present day--it has taken all that time to produce a population of four billion people. In the year 2010 there will be eight billion. In 2040 there will be sixteen billion. The need for food is increasing at the rate of 12,000 pounds per SECOND! This plight is worsened by the fact that in many lands agriculture cannot keep up with the incredible demand due to poor and depleted soils, extreme climates, meager seed supply at planting time and, of course, a desperate lack of water.

We are all aware that one answer will not suffice to solve Africa's problems. Many creative approaches are needed to stem the devastation of starvation and malnutrition on a long term basis.

First, let me say that we at Africa Tomorrow feel that sending food to starving people is a very loving and moral thing to do. But we believe that teaching those people to raise their own food, and become nutritionally self sufficient, is even more loving and moral. Today I want to discuss one unique option for feeding hungry people everywhere.

The things that make our technology unique are: 1.) Where other methods require the use of fresh water, ours can thrive in fresh, saline, alkaline or even brackish water. 2.) Where other solutions need nutrient rich soils, ours works exceedingly well in the worst, impermeable clay soils which cannot support conventional agriculture due to the fact that water will not drain. And 3.) Where many systems require costly, commercial fertilizers--ours can be sustained by free animal wastes. With these three elements we can provide an inexhaustable chain of food, supplying a total nutritional balance which, once begun, will continue in perpetuity. The only requirement after implementation is supervision which can be easily taught to the African people. Now, let me briefly explain the process:

Hydrological reports demonstrate that there are countless water tables not far below the surface of Africa. However, this water is usually salty or brackish. Within close proximity to the villages, shallow ponds will be hand dug in the clay soil and filled with water that is pumped from underground using solar energy to electrify the pumps. Then pond number one will be fertilized and stocked with fingerlings of a very prolific fish, indigenous to Africa, called Tilapia. The result of water fertilization is an abundant bloom of micro-algae including

Spirulina. Tilapia are not predators who eat their young. They are herbivores who can reach maturity by feeding exclusively upon the algae. In tropical countries the female tilapia spawns from three hundred tu five hundred offspring each month. The progeny are put into pond number two and grow to approximately three pounds in six months time, then they begin to propagate. Meanwhile, pond number one continues to multiply on a monthly basis, and so on. The amount of people to be fed determines the number of ponds needed. The result of this cycle is staggering. Each acre of water can provide up to seven tons of fish annually. The amount of spirulina that can be harvested is likewise staggering. Enough for the fish, the people and any livestock. My learned colleague, Dr. Heimlich, will define the nutritional advantages of these foods.

Summing up, there are several crops that tolerate salt water and proliferate extremely well. Indigenous to Africa are duck weeds, water sprouts, water clover and water buds. These plants are rich in carbohydrates and when sun dried, provide a flour from which conventional bread, cakes and other dishes can be baked.

I believe that science will ultimately solve the problems which currently beset the African continent. But in the meantime, village level fish farms can adequately feed the people during the bleak periods, while viable technologies restore Africa's long term productivity and increase agricultural output to that of former times. We believe that our low tech method will meet Africa's current need, and we are guided in our thinking by one of our directors, an African gentleman, Dr. James Kamusikiri, who constantly apprises us of African Socio-Politico-Religious attitudes.

And lastly, Africa Tomorrow is vitally involved with other creative solutions to desertification, reforestation and water harvesting in an effort to make sustained use of African rains which generally occur heavily and in short periods of time. My co-directors will testify on these systems later. Thank you for giving me the opportunity to address this august body. Now, may I present Dr. Henry J. Heimlich.

Dr. Paul Winchell

10-23-85

Dr. HEIMLICH. Thank you, Paul.

Mr. Chairman, Congressmen and Congresswomen, thank you very much for the privilege of being here to speak to you today.

It was gratifying to get a letter from President Reagan saying that Mike Deaver had saved his life with the Heimlich maneuver, and this morning to have Congresswoman Meyers tell me about an instance where a friend of hers used the maneuver to save a life. But each time I hear of a life saved, the pleasure is dispelled knowing that 40,000 children around the world are dying every day of starvation and infection. Yet, the technological advances are present that enable the economical production of protein foods adequate to maintain optimal health even in impoverished societies.

Spirulina is a primitive water plant. It's a green growth found on the surface of ponds. It's nothing more than the scum on the top of the ponds. And yet it's high in protein. It's 65 to 71 percent protein by weight and has a moisture content of only 7 percent. Beef steak is 54 to 70 percent water, because you can't have a juicy steak without water.

The quality of a protein is based on the amino acids that it contains. There are eight essential amino acids. You cannot build them within the body unless you tear down the body; you must take them in on a regular basis. The eight essential amino acids are present in spirulina. And in addition, there are 10 additional amino acids, including histadine and arginine, which are necessary for growth in children in adequate amounts. And there are vitamins and minerals that are also present in generous proportion.

Three ounces of spirulina will supply a total daily protein requirement for almost any normal person engaged in a moderate amount of activity. That can be supplemented with calories from grain and other sources.

Now, here the medical distinction between marasmus and kwashiorkor among infants becomes critically significant.

Marasmus is a state of total starvation. These babies are small, wrinkled, and have a skin and bones appearance from the muscle wasting, and their bellies protrude. They may have shrunken faces and short limbs, and they develop a diarrhea which can be fatal. But they don't show signs of vitamin and mineral deficiency.

The kwashiokor baby, on the other hand, suffers from a protein starvation though the other food supplies may be adequate. These pitiful infants, who go blind from vitamin A deficiency with drying out of the eyes, called xerophthalmia, followed by rupture of the eye and scarring of the cornea. Their bodies are swollen with edema fluid and the skin is depigmented and riddled with fissures, rashes and bruises. And they succumb to infectious diseases of little consequence to the normal infant because the T-cell lymphocytes in their immune system are impaired. That makes them similar to AIDS victims, who have the same defect by virtue of a virus.

We can cure and prevent kwashiorkor with spirulina today. Which African child, if it survives, might develop the cure for cancer? What young Latin American minds, if saved, will ensure human rights in their countries? And which Asiatic infant may eventually say the words that bring universal love?

When the superpowers together see fit to devote their science and technology to feeding children, rather than to diverting the talents of brilliant scientists and engineers to destruction of human life, we will have a world of lasting peace and prosperity.

I would like to point out that this is immediately possible, and there is experience in my own life which has seen this. During World War II, 40 years ago, I was in China. I was in northwest China. I joined the Navy because I liked the ships and salt water, and so they sent me to the Gobi Desert in a guerrilla army, and I was riding a horse. But I opened a clinic while we were settled down in one place for 8 months, and I saw 100 to 200 patients a day. And I traveled extensively through China and, after the war, I got to the coast. And all I saw was disease and starvation, people dying on the street, people in rags, physical deformities. By virtue of that service, I was invited back last year to China. And I was amazed to see strong, healthy people, well dressed, carrying out productive work wherever I traveled. That was in 40 years.

So it is possible to accomplish this end anywhere in the world, and surely in Africa where this technology we've spoken about today is readily available. I think that this technology offers a practical means for our preserving humanity's greatest asset—our children.

Now I'd like to turn the floor over to Mr. Richard Dreyfuss.

[The prepared statement of Dr. Heimlich follows:]

Spirulina and Tilapia as a Remedy for World Hunger

Testimony before the U.S. Congress, October 23, 1985

Henry J. Heimlich, M.D., President, Heimlich Institute
at Xavier University, Cincinnati, OH 45207-1096

It is always gratifying when a mother tells me she saved her choking child's life using the Heimlich Maneuver -- or a son saved his father, a restaurant waiter saved a diner. I particularly appreciated a letter from President Reagan describing how Mike Deaver used the Heimlich Maneuver to help save the President's life when he was choking. But each time I hear about a life saved, the pleasure is soon dispelled by the nagging thought that 40,000 of our children die of malnutrition and infection every day. They are our children whatever their race, nationality, or geographic location. It is sadly ironic that Americans are choking on steak while starvation is rampant elsewhere.

Technological advances now enable the economical production of protein foods adequate to maintain optimal health in impoverished societies. Production and distribution of algae known as Spirulina or fish such as Tilapia could do much to solve the world hunger problem.

Spirulina is a primitive water plant found as a green growth on the surface of ponds. It is a prolific source of low-cost protein of high biological value and apparently good palatability. Some consider Spirulina "richer than steak" and superior to protein of animal origin. It is 65 to 71 percent protein by weight and has a moisture content of only 7 percent. Beef steak is 54 to 70 percent water -- you can't have a juicy steak without water to make up the juice.

The quality of a protein is based upon the amounts and proportions of the amino acids of which it is composed. To maintain the processes of life, the human body must have a constantly replenished supply of amino acids from which it assembles its own proteins. These protein building blocks are preferably obtained from the digestion of food. During periods of deprivation, however, the body is forced to break down its own living muscle and other body tissues to obtain the components for the manufacture of human proteins. Normal metabolic processes can convert some amino acids into others as needed, but eight amino acids cannot be synthesized from anything else and must be a regular part of the diet.

The consumption of Spirulina as the sole source of protein in a human diet can in fact provide for optimal health. In addition to supplying the eight essential amino acids in optimal proportions, Spirulina supplies adequate quantities of two additional amino acids, histidine and arginine, which the body of a growing infant or child cannot synthesize in adequate quantity for normal development. Vitamins and minerals are also present in Spirulina and available in generous proportion. Like other agricultural products, Spirulina must not be grown in contaminated waters.

Three ounces (85 grams) of Spirulina will supply the total daily protein requirement for almost any normal person engaged in a moderate amount of activity (except a pregnant or lactating female who would need somewhat more). The 85 gram Spirulina ration would supply about 350 calories. Another 2000 to 3000 calories can be provided by cereal grains (e.g., millet, wheat, rice), sorghum, legumes, duckweed, water sprouts, or sugar. Without such caloric supplementation, the protein would be wasted and burned as caloric fuel. With excessive intake, the protein metabolites could produce dehydration and fever associated with protein intoxication, aggravating the starvation, elevating blood ammonia levels so as to interfere with liver function, and causing or hastening death.

Here the medical distinction between marasmus and kwashiorkor among infants becomes critically significant. Marasmus is a state of total starvation: these babies are small, wrinkled, and have a "skin and bones" appearance from muscle wasting which can also make their bellies protrude. They may have shrunken faces and short limbs, and they develop a diarrhea which can be fatal, but they show no symptoms of vitamin and mineral deficiency. Marasmus has a rapidly fatal outcome if treated solely with high protein foods.

The kwashiorkor baby, on the other hand, suffers from protein starvation resulting from a diet nearly adequate in everything but protein and micronutrients. These are the pitiful infants who go blind from vitamin A deficiency with drying out of the eyes (xerophthalmia) followed by rupture and scarring of the corneas. Their bodies are swollen from edema fluid and the skin is depigmented and riddled with fissures, rashes, and bruises. They succumb to common infectious diseases of little consequence in normal infants because the T cell lymphocytes in their immune systems are impaired, making them similar to AIDS victims (who have acquired immune deficiency syndrome following infection with human T-lymphotrophic virus type III). Kwashiorkor can be cured by Spirulina supplementation.

Fish such as Tilapia provide an additional protein source and add variety to the diet. Fish farming has the benefit of making agriculture economically viable on marginally arable land: areas previously used as fish ponds can be rotated to grow more conventional farm crops while land too poor for standard farming can be productively used as fish ponds pending its enrichment by fish breeding. It can then again be cycled into use as farmland. The agricultural products previously mentioned as being necessary for caloric supplementation can then be grown. Attention would have to be given to water contaminants such as metallic and biologic poisons to prevent their concentration in the fish.

Incidentally, according to a report from the Netherlands recently published in the New England Journal of Medicine (New Eng. J. Med. 1985; 312(19): 1205-9), Americans and Europeans also do well to add fish to their diet: an average of 30 grams a day (just over an ounce) apparently cuts the cardiovascular death rate in half, in comparison with heart attack rates among those who eat no fish.

There need be no concern that providing nourishment to prevent deaths in developing countries will lead to overpopulation. In West Africa, where various nutrition and vaccination programs have reduced infant mortality, studies show that population-growth rates are the lowest in the developing world. Parents produce the number of children they want, rather than compensating for those who die.

Which African child might develop the cure for cancer? What young Latin American minds, if saved, will ensure human rights in their countries? Which Asiatic infant will eventually say the words that bring universal love? When the superpowers together see fit to devote their science and technology to feeding children, rather than diverting the talents of brilliant scientists and engineers to destruction of human life, we will have a world of lasting peace and prosperity. Until then, the technology presented today offers a practical means for preserving humanity's greatest asset, our children.

ACKNOWLEDGMENT: Research and editorial assistance was provided by Gerson C. Carr, M.D., Heimlich Institute at Xavier University, Cincinnati, OH 45207-1096.

Mr. **Dreyfus**. Thank you.

Mr. Chairman, members of the committee, as you have heard, the underlying causes of famine in Africa are constant and have not gone away. The conditions that cause such devastating reaction to drought are also constant and have not gone away. And further, it is apparently not only Africans that we are losing, which is terrible enough, we are also losing Africa itself—the desert claiming a yearly toll of usable land.

It seems to me the problems are what is to be done now that can affect the future in Africa, and what can be done to change a seemingly inevitable recurring cycle of famine and drought and death. Someone once said, if you give a man a fish you give a man a meal, but if you teach a man to fish you create the ability to feed himself and his family, and you also give him a livelihood to sustain his future. This is the heart of Dr. Winchell's fish farming proposal.

But there is something even more important, and it is this that got me involved. Africa is strewn with the bones of the well-intentioned: the inappropriate projects that did not bear up under scrutiny, that failed because of a refusal to take into consideration local needs and local customs; programs that neglected to scout ahead, that forgot to marry into the family, as it were; huge milking machines with instructions only in German; tractors from the American Midwest, which by disking in the tried and true, perfectly normal North American method, without proper groundwork and preparation upended the nutrient topsoil and sterilized it, ruining the soil for ages. Meaning literally hundreds of years.

Now, this. In a meeting Monday with Ambassador Youssoufou, the executive secretary of the Organization of African Unity, his very first parenthetic remark after hearing our proposal was that we were the very first organization who had ever solicited the opinions of him or his staff, who had ever asked do you think that this will work, or how would this work with your people, or whatever. He was extremely enthusiastic. He gave us his fervent support because we were doing just that and we were dealing with Africa on a village-to-village basis. There were after all, he said, not just 50 nations, but 1,000 tribes, 5,000 dialects all different from one another as the night and the day.

The proposals of Africa Tomorrow, those of Dr. Winchell and Dr. Irwin-Williams, who you will hear in a few moments, seem to make sense. They seem to be appropriate. In a way it reminds me a little bit of the Marshall plan. We can institute a training on the village level. It can be taught by the villagers themselves to their sons or daughters or neighbors, and we can leave. We can restart an ecological cycle and let it run naturally, unhindered by constant fixes of funding or even the need for alien experts. It seems to me that there is nothing wrong with this picture.

Thank you very much.

[The prepared statement of Mr. Dreyfuss follows:]

STATEMENT OF

RICHARD DREYFUS
AFRICA TOMORROW

Mr. Chairman and Members of the Committee.

The underlying causes of the famine in Africa are constant and have not gone away. The conditions that cause such devastating reaction to drought are also constant, and have not gone away. Further -- it is apparently not only Africans we are losing, which is terrible enough; we are also losing Africa itself, the desert claiming a yearly toll of useable land.

Here is the ongoing problem:

> What is to be done now that can affect the future in Africa?
>
> What can be done to change a seemingly inevitable recurring cycle of famine and drought and deaths?

Someone once said, "if you give a man a fish you give a man a meal. But if you teach a man to fish you create the ability to feed himself and his family, and you also give him a livelihood to sustain his future." This is at the heart of Dr. Winchell's fish farming proposal. But there is something even more important, and it is this that got me involved.

Africa is strewn with the bones of the well-intentioned, the inappropriate projects that DID not bear up under scrutiny, that failed because of a refusal to take into consideration local needs, and local customs; programs that neglected to scout ahead, that forgot to marry into the family:

> Huge milking machines with instructions only in German.....
>
> Tractors from the American mid-West which by Discing in the tried and true, perfectly normal North American method and without proper ground work and preparation, upended the nutrient topsoil and sterilized it, ruining the soil for ages, meaning literally hundreds of years.

And gentlemen, one more quick anecdote: In a meeting Monday with Ambassador Yousoufou, head of the Organization of African Unity, his first parenthetic remark after hearing our proposal was that we were the first organization who ever solicited the opinion of him or his staff, who had ever asked, do you think this will work or how will this work with your people or whatever. He was extremely enthusiastic and gave us his fervent support because we were doing just that, and dealing with Africa on a village to village basis. There were after all, he said, not just 50 nations but 1,000 tribes, 500 dialects, all different from one another as the night and day.

The proposal of Africa Tomorrow, those of Dr. Winchell and Dr. Irwin-Williams, seem to make sense; they seem to be appropriate. In a way it reminds me a little bit of the Marshall Plan -- we institute training on the village level that can be taught by the villagers themselves to their sons or daughters, or neighbors, and we leave. We can restart an ecological cycle and let it run naturally, unhindered by constant fixes of funding or even the need for alien experts. It seems to me there is nothing wrong with this picture.

Thank you.

Mr. VALENTINE. Thank you, gentlemen, all of you for brilliant statements that put in appropriate language an opportunity and responsibility which not only we have in the Congress, but which we share with citizens all over this country.

I want to say to you, I want to underscore what Mr. Asner said at the beginning. That while we might disagree, while I might disagree with some other positions which some members of this panel might have taken or might take in other areas and involving other causes, I think we are in agreement that this is a matter which, if we don't begin to address, then we are going to see not only a catastrophe in the loss of human life in the future, but a political catastrophe on that continent.

I want to tell you that I am proud to be in your company, because all of you could be doing other things today. You are very gifted Americans, and I suppose that each one of you has a little money in the bank and you don't have to be doing this. You are for those reasons national treasures, perhaps. So I want to for this committee, for the chairman, to thank you for the time and effort that you have given to this, and to urge you to continue and to keep after your Congressmen. Because we need to be reminded, all of us, of our responsibilities. We all need to be reminded I suppose that we are indeed our brother's keeper.

I want to ask Dr. Winchell, and maybe I should have looked at him the whole time because I understand that he is able to change his voice, and maybe he was doing all this Academy Award. [Laughter.]

This question maybe answers itself; and to you, as an expert, you might wonder why I would even ask it. But it is not that clear to me. Would this method of fish culture, could that be introduced into the streams and rivers of Africa; if you would introduce the substance on which these little fishes would feed into a river or a creek or a stream and just see what happens?

Dr. WINCHELL. If it were a body of water that were not actively moving.

Mr. VALENTINE. It has to be an impoundment, a lake or a pond, not moving?

Dr. WINCHELL. It has to be a contained body of water that requires a minimal amount of management. The water itself has to be fertilized so that it will promote this bloom of the microalgae and the spirulina. You could introduce the tilapia into the streams and the rivers, but you might suddenly wind up with an overcrowding without the management, which would produce very, very tiny little fish, and they would turn out to be pure scavengers. Without having their food taken care of, so that they would not have enough to eat or enough room. With a little management, keeping them contained and not overcrowded, these tilapia can grow. The average female grows to about 3 pounds, and the male almost twice as big. And you can do the most amazing things with these creatures. This may sound rather chauvinistic, but when I finish you'll see what I mean.

When the tilapia are first born, the fry has no sexual characteristics. So, if you segregate them to another pond and add a bit of methyl testosterone, they all turn into males. Now, the reason we do that is because males grow twice the size and therefore provide that much more flesh.

Mr. VALENTINE. Can you do the same thing with catfish?

Dr. WINCHELL. I doubt that. [Laughter.]

Mr. VALENTINE. We know about this sort of thing down South. We grow catfish that way.

Dr. WINCHELL. I doubt that very much. No. I doubt whether you can manipulate catfish as well as you can tilapia.

I've chosen tilapia because I did have some experience in the 1970's with a prototype project in Saugus, CA. And I worked with these creatures, and I had these ponds. And the thing I'd like to stress is that this is low-intensive technology. It doesn't require anything more than just the ponds, the management of the water and the fertilization, and from then on, the cycle, once begun, just continues forever indefinitely.

Mr. VALENTINE. Doctor, what is your answer to criticism of this kind: that this is all well and good, but this type of thing is too technology intensive and requires highly trained personnel that might not be available in that part of the world?

Dr. WINCHELL. Well, whoever brought up that point was—I don't know exactly what they were referring to because it's not too specific, but I imagine that what they were referring to were those huge fisheries which we are very familiar with which are high intensive technologically and do need personnel.

We are stressing the village-level operation. If you will, call it the backyard operation, rather than the high-powered type that requires cement ponds, hardhats, people walking around and scientists. This is a different approach, not trying to create that amount of flesh, but to provide a separate source for each village.

Also, the fact that I have tried to introduce saltwater into the operation which I know works very well because I've had that experience. The African Continent is completely surrounded by saltwater. We could have canals coming in from the coast and have these operations there.

But we are—we have an aversion to a centralized, huge facility for the same feelings that we all have: will that food be transported to the people that need it? So we stress a village level, so that each village may have its own facility.

Also, it gives work to the African people which restores their dignity and eliminates an unhealthy situation. Because if you keep giving handouts, you destroy initiative.

Mr. VALENTINE. Thank you, Doctor.

Representative Schneider.

Miss SCHNEIDER. I've been attempting to resist grandstanding for the past 3 hours now, but I can resist no longer. I think that, Dr. Winchell, you are the one that used the word, that you were chauvinistic about your research and about the tilapia fish farming progress that you have made. I'd like to share with the panel that it just so happens that I represent the University of Rhode Island and you can say whatever you like about Scripps University, but I happen to believe, as do many others, that the University of Rhode Island happens to be one of the foremost universities insofar as oceanography research and fish farming are concerned. And I'm happy to share with you that, picking up on the question of training, is that we have the technological capability, as you say in your testimony, to feed many; but it's important to recognize that training is a key element. And I know that there is often resistance to the capabilities of the folks who are living in whatever country. In this case we are talking about Africa.

The Opportunities Industrialization Centers, [OIC] which is a group that was formed back in the 1960's, is a group that is funded by the USAID. And in the 1970's, they started to branch out from focusing on areas where they could train and teach individuals in the inner city, primarily the black populations, on how to better help themselves. The OIC has now gone international and they have several projects in Africa, in seven countries in particular. And at this point the University of Rhode Island and the OIC from Rhode Island is working to develop aquaculture in some of these nations at this time.

So our partnership and continued networking I would think would work to the advantage of not only the Africans, but also Rhode Island and also, of course, Auburn and your other interests.

But I'd also like to point out that training is an issue that seems to continually present itself. One of the first hearings that we had in a series here was to focus on the role that science and technology can play insofar as climate is concerned. Now, we may have our polar orbiters and we may be paying our tax dollars to gather international data on drought trends, but one of the difficulties is once we have that information and we transfer it to Africa or to a specific country are there the foreign nationals there who are well enough trained to interpret that information and then utilize it?

And I think that this is a need that is being addressed by Dr. Gus Speth's blue ribbon panel that is focusing on additional training being included in some of the legislation that we're discussing in one of those recommendations.

So as you are testifying and clearly defining some of the problems and the solutions, I think it's useful to recognize that that testimony is very helpful to us as we are shaping legislation. And as it stands right now, the one recommendation will focus on requiring training of foreign nationals in the area of environmental impact statements and in the interpretation of research proposals. And I am hopeful that aquaculture will be one of them because that happens to be one of my pet interests, because I also serve on the Merchant Marine and Fisheries Committee and have struggled along to see that we had adequate funding for those programs. And I regret to say that we have not. So I am delighted that you, as a representative of the private sector, have been moving along in that area.

Now, after all of that——

Mr. ASNER. Congresswoman Schneider?

Miss SCHNEIDER. Yes?

Mr. ASNER. I would say that in our meeting with Ambassador Youssoufou, a gentleman who was his assistant there, an economist from Sudan, spoke at good lengths of the graduates they turn out of the University of Khartoum trained, educated in all of this but with no funds, no foreign help to institute it. So the field of talent from what they informed us of is lying there fallow waiting to be used.

Miss SCHNEIDER. Um hum. Thank you.

One of the questions that I did want to address to Dr. Winchell, or anyone else who would like to comment, is that one of the difficulties that the United States and other developed nations have had is the effort for us to impose our cultural ideas or technologies on developing nations, often to the detriment of those nations.

Now, in your proposal for fish farming, it is said that farming is not an esteemed occupation among many of the African countries; and, furthermore, many Africans do not include fish as a palatable portion of their diet. I wonder if you could please address that.

Mr. WINCHELL. According to Ambassador Youssoufou that does exist in certain tribal areas, but to a minimum. I think that has been really blown up, and the emphasis that is put upon it, according to him, is that this is really not a problem because the majority of the African people welcome fish, eat fish. The comment you made is true, but I think that the focus upon it has been a little distorted.

Miss SCHNEIDER. OK. Thank you. Thank you, Mr. Chairman.

Dr. HEIMLICH. May I speak to that?

Ambassador Youssoufou also mentioned, for example, that in one part of Africa the women do the fishing and in another part it's the men. I think it is a good idea not to talk about Africa. You have to talk about individual tribes, individual areas, individual people. And maybe we can't feed all of Africa, but you can certainly feed those people who do like fish, and that's the greatest majority.

Miss SCHNEIDER. I think that that is a very significant point because we do have the tendency to look at it as an entire similar culture when in fact it is not.

Let me also just point out, since you mentioned the number of women fishing, that it's rather staggering to realize that 60 to 80 percent of all agriculture throughout the world is performed by women. Yet, women own less than 1 percent of all of that property. So that I hope you gentlemen in future conversations with ambassadors, or whomever, would please put in a good word for pushing equality on that regard, also.

Thank you.

Mr. **Valentine**. Would you gentlemen—thank you, Claudine. Would you like to add that to your list of things to correct in Africa, also? Let me suggest to you that if you teach these ladies to fry that fish in deep fat and fix some hushpuppies, there's nowhere in the world that they—like that.

Dr. **Heimlich**. We can always add testosterone to the water.

Mr. **Valentine**. Oh. Mr. Chairman?

Excuse me. I didn't——

Dr. **Heimlich**. It's not important.

Mr. **Scheuer**. Thank you, Mr. Chairman.

Claudine Schneider hit on a very basic point. The role of women and the status of women is probably more central to the galloping population rates in Africa than any other one single subject. We've done, the World Fertility Survey that was done a couple of years ago tells us that a large majority of all married women in Africa do not wish to have any further children, but because of a pervasive macho attitude among males they are condemned to eternal annual childbearing, much of it against their wishes.

So until women, I think the experience is, until women have the means of controlling their fertility, the contraceptive devices of all kinds so that they have freedom of choice, and the incentive to control their fertility, which means giving them other life options to constant childbearing, which means access to education and access to the world of work, access to credit, increase in the age of marriage so that they can acquire education and job training, we're going to see this disequillibrium between food and population that we've been discussing.

The population is increasing at the rate of 3.5 percent a year and food production is increasing at the rate of 1.1 percent a year. As Dr. Heimlich mentioned a few minutes ago, starvation and hunger is an intensely personal thing, an intensely individual thing. When we talk about hunger, it means individuals don't get enough to eat. The inability on a per capita basis to feed the masses of sub-Saharan Africa.

Is your group working only on the one end of that balance wheel, on the food production? Or are you working also on the effort that many of us are involved in to help the young couples of Africa to achieve their family size goals, which in some cases means a problem of sterility, which means we help them conceive, but in the overwhelming majority of cases means that we help them in child spacing which radically reduces the total number of offspring that a woman will have from the 8.5 median number of children that the women of Kenya produce in their childbearing years to something like 3?

Are you working both ends of that equation, or are you mostly concentrating on food production?

Dr. **Heimlich**. I would just like to make one statement on your first message. In West Africa, it's an area where they improved the nutrition and vaccinated the children with increased survival. And that area now has the lowest birth growth rate of any of the developing nations. That has actually occurred.

Mr. **Scheuer**. The point you're making is absolutely correct. That young couples want to produce enough children, a couple or two or three children to provide their social security in their senior years. They don't have our Social Security system. Kids are their social security system, and they have to assume that there is going to be a devastating toll of infant mortality on their offspring, so they have far more kids than they might otherwise want to have. But they do it to ensure that one or two will survive.

And just as you say, when they have clean water, and better nutrition, and preventive innoculations so that they begin to feel after a few years that the 3 or 4—2, 3 or 4 kids that they do have will survive, they don't need to have 8 or 10 kids to have 1 or 2 survive, and birth rates go way, way, way down. You're absolutely right.

Mr. **Asner**. I believe that was pointed out with the Ethiopian crisis. That famine is not a population control system. And I would say no, we have not directed ourselves to—other than in satisfying the goal through the method of food, we have not directed ourselves toward population control.

I would hope that you would have the time to hear our other two speakers who are to occur in the second part of the discussion because our program does contain a particularly unique element dealing with water harvesting, which, of course, is a technique that goes far beyond fish farming. And so I would hope that when you finish questioning us, grilling us, so to speak, you would be able to hear our two eminent succeeding speakers.

Mr. **Valentine**. This is some grilling. [Laughter.]

Mr. **Scheuer**. Let me followup with just one rather bleak comment. Unfortunately, and sadly, and tragically, as Mr. Morse has pointed out to us a century or more ago, famine is a very effective population control system. In fact, over the millenia populations have been controlled by all kinds of natural disasters, and that's why it took us, perhaps, a million years to achieve our first billion in 1830. And it was only when we began to produce better food, and a little better nutrition, and a little better sanitation, a little more pure water, a little more in the way of preventive—of innoculations to eliminate preventable disease in the last century we've gone from 1 billion in 1830 up to the 4.4 billion today, and from here on in the figures are going to go through the wall.

Famine has been traditionally—famine, wars, pestilence, disease—those have been the population limiters that nature has provided in the absence of man's ability to control population growth by more humane, humanitarian, civilized means. What we're trying to do is achieve equilibrium by, on a per capita basis between people and food, eliminating starvation as nature's population controller. Achieving equilibrium so that there is enough food on a per capita basis through man's ability to control his own destiny, through voluntary measures of family planning on the one hand, and at the other end increasing food production by all of the means and methods that you have so thoughtfully pointed out.

Mr. **Asner**. Thank you for the education, Mr. Chairman.

Mr. **Valentine**. Jan.

Mrs. **Meyers**. I'd like to ask just a couple of quick questions. You have mentioned—and I'll direct this to Dr. Heimlich—that both I think spirulina—is that the way you say it—and tilapia, both are protein sources. What kind of assistance will you need to enable people to grow the other kinds of things that they need in addition to the protein?

Dr. **Heimlich**. That's very important. If you just feed people protein, particularly starving people, you can kill them. They will dehydrate and get various liver diseases and other diseases. Now, the important thing about the fish farming is you can take land that is not arable and you can grow the spirulina there with a minimum of water, which will then enable the fish to live off the spirulina—the tilapia. And by breeding the fish, that makes that portion of the land fertile. You then can move the fish to another pond and you can grow the grains, sorghum, and sugar, the other things that are necessary, the carbohydrates, to provide the calories. And that is a self-perpetuating thing. And you just have to move them from one to other, and then come back again and rotate them.

Mrs. **Meyers**. Have we tried, have you tried any kind of a pilot project so that you know this will work and you know it will be acceptable to people?

Dr. **Heimlich**. Paul.

Mr. **Asner**. This is our pilot.

Dr. **Winchell**. Yes. As a matter of fact, as I mentioned before I had a pilot project in Saugus, CA, in which I was working with these same creatures and various other disciplines that became an integrated farming experience. And not only can I guarantee that it does work, but the very fact that aquaculture goes back to the ancient Egyptians who were practicing it 4,000 years ago, and at that time they didn't have the intensive technological help and knowledge, they were doing it extremely well. It could be done on a primitive level. And it does work because actually what you're doing is you're taking the fish which normally would be in the streams and you're confining them, and you're feeding them by producing the algae.

But as I mentioned before in the testimony, to directly answer your question, with the application, if you're going to use fresh water and you have that, of course you can grow conventional crops. But in the sub-Saharan regions, if you can use saltwater, there are these four or five crops that will proliferate extremely well with saltwater and they all contain, extremely rich in the carbohydrates. And when you sun dry them you get flour, and then you can bake, you can have bread, you can have cakes, you can have all kinds—that will augment the protein and that will give you the balanced diet to prevent the conditions that Dr. Heimlich was talking about.

Mr. **Asner**. In addition to that, as we said, Auburn, approaching the eminence of the University of Rhode Island, of course, has created our project and has been very successful in Jamaica. I believe it has participated in Zaire with the project, as well as our own Peace Corps has operated tilapia farms in Zaire. So they do succeed. They do survive.

Mrs. **Meyers**. I think my final question would be that I—our first concern, of course, is to feed people so that we don't have hungry people in the world. My second concern in Africa has been certainly that of population. I'm not sure that I share your optimism that we won't be creating an enormous population problem in that part of the world. And I guess I'd like to hear some more comments from you along those lines.

Certainly no one thinks of famine as being a solution to the population problem. That's just unthinkable. But I do think that if you are going to provide a source of nourishment so that people live longer, healthier lives you had better take population into account when you're doing it or you create other problems that you hadn't intended to. And I'm concerned about it and I'd like to hear your comments, all of you, or any of you.

Dr. WINCHELL. Well, I think that Dr. Heimlich articulated extremely well, and Congressman Scheuer also reiterated what he said, and it does make sense. Producing a great deal of children is sort of an insurance policy that they will survive. But the moment that you have assurance that, by being fed, your children will survive, I think that begins to whittle away at the incentive of producing many, many more. You don't need the insurance policy. And I think the fact that the population has—the childbearing has really dropped is pretty good evidence that that is so.

Dr. HEIMLICH. I think again if we look at China, their population has vastly increased. Over 1 billion, and they are taking rather drastic measures to overcome that. But the fact is that people are much more productive, and before when they had the starvation there was not enough food. Today, with the increased population, they're able to feed their entire population. And I must say that aquaculture is one of the basics for 5,000 years of growing of rice and grains in China, the ponds that they use.

So that yes, the population I think will increase, but I think there is a natural, eventual natural means of adjusting to it.

Mr. VALENTINE. Thank you—excuse me.

Mr. ASNER. I would only add that until you supply the food to make a country stable you will not then be able to apply the other arts necessary to create adequate population control. So I think food is the first step on the ladder to control.

Mr. VALENTINE. Thank you. Thank you very much, gentlemen. It's the chairman's prerogative to get one parting shot. If you don't have anything—the context of what's been said here about higher education, if you don't have anything that you can say here about Duke University, which is in my district, would you get something and file it, please? [Laughter.]

We thank you very, very much.

Mr. Lloyd Timberlake. Our next witness is Mr. Lloyd Timberlake, author of "Africa in Crisis," editorial director of Earthscan, an international natural resources group, formerly a reporter with Reuters, has traveled extensively in Africa.

Mr. Timberlake, we are delighted to have you here today. And your, the text of your statement will be filed and you proceed in any way that you deem appropriate. We would appreciate it if you could summarize or condense what you have to say.

STATEMENT OF LLOYD TIMBERLAKE, EDITORIAL DIRECTOR, EARTHSCAN

Mr. TIMBERLAKE. Mr. Chairman, members of the committee, thank you very much. I'm very pleased, very honored to be here. A little frightened to be up here on my own, as I have noticed in the course of the hearings this morning how well briefed you all are, and this is a bit off-putting.

I shall probably ramble a little bit, depart from prepared text, and try to fit what I have to say into what's gone before. I think I am before you because I wrote a book which tried to explain the African crisis to people not particularly interested. And the report found that the crisis was largely a result of policies, basically policies in which African nations tried to develop their cities in which the governments lay at the expense of the countryside, at the expense of the 80 percent of the population which tried to get a living off the land. Now, this has caused an environmental crisis in two senses.

One, these policies have caused the environment to be hammered. They have tended to push people into marginal lands. They've tended to overuse a fragile environment, to take the trees off, to overgraze, overcultivate, and this has led to what we refer to as an environmental bankruptcy. It simply means an environment which has been so overdrawn that it can give no more and something else is going to have to be put back in.

This leads to the second way in which this is an environmental crisis. For Africa to get out of its spiral of moving apparently evermore rapidly from one crisis to another, we're going to have to figure out ways of getting aid and technology into the environment to balance the accounts. And this is going to be extremely difficult. The Sahel suffered an environmental crisis in 1968 to 1973 which was commonly referred to as a drought. And once again I think it was more a policy crisis. But after that drought both the African nations themselves and the donor nations agreed that feed self-sufficiency was their prime goal.

And we look back at the way aid is going into the Sahel region since that crisis and we find that we've continued to do things in the same old way. We continue to use our aid to build things in the countryside—to build roads, to build dams, to build storage centers—but we haven't yet found a way to get the aid into the environment, into the soil. And in fact, looking over a decade of aid to the Sahel, we find that only 4 percent went to rain-fed agriculture, the way food in the region is grown, and less than 1.5 percent of all of those billions of dollars went into the sort of ecological projects which will provide a basis for survivability in the Sahel.

And I think, as I say, departing from my prepared text, I'd like to echo what Mr. Dreyfuss had to say about the way we've practiced aid in the past. We have tended, and this applies to every northern aid agency, to sit in Washington, in London, Paris, and Ottawa, and to come up with what looks like extremely good technology. Technology that we can make work in California, North Carolina, Rhode Island, Louisiana, but technology which once we try to put into Africa it, for many complicated reasons, doesn't work.

Now, we shouldn't have to relearn this lesson here in the United States because the United States in the thirties suffered an environmental crisis very similar to the one that struck Africa now, in the Dust Bowl. And if you look at some of the pictures of the Dust Bowl era in the United States, in Oklahoma, and you see families with almost no possessions fleeing sandstorms, taking shelter in the hovels in which they live, and then you compare these to the photographs coming out of Africa today you will see a striking similarity. And what our Government did then to allow these people to not only survive and prosper in the Midwestern and Western United States was not to send salesmen out from Washington to lay technology upon them in these areas, but to go out and find out what the people were up to, what they were up against, what their strategies were, how they were trying to survive, and work with those people to bring their problems back to the universities, back to the Capital and to work on them, and it was a grassroots sort of development.

Now, the way we're practicing aid today we simply can't do that. Because aid going out, again from Washington, but from all of the other countries in the north, tends to go out in packages of 2 or 3 years based on contracts drawn up by experts in these various countries. There is no way to change these contracts. There is no way to learn from mistakes. There is no way to make things up and make things better as you go along. And that's the sort of thing we're going to have to work into our aid in the future. And it is not to say this committee's focus on research and technology is wrong, it's to say that we need a focus on anthropology, if you will, but on what's happening in Africa before we can make any of this technology—the tilapia, the water harvesting. Before we can make any of it work, we've got to understand better what the people of Africa are up to.

And I'd like to close with two almost contradictory points. Getting technology into Africa is going to be an opportunistic process, taking advantage of situations for what United States agencies want to do and can do, match up with what African societies at national and local levels want to do and can do. And good opportunities are going to be relatively rare, so the U.S. agencies will have to rely more, much more than previously on the work of anthropologists and sociologists to keep them informed. Too often in the past, lack of good knowledge has hampered a project and called it ultimate failure. But once the opportunity has been seized it should not be abandoned lightly. Africa's slide into this crisis was a long, slow cycle of decline, and it will take a long time to reverse the decline. Short-term fixes and sudden changes in policy have been and will continue to be more a part of the problem than a part of any solution.

Thank you very much.

[The prepared statement of Mr. Timberlake follows:]

Earthscan

1717 Massachusetts Ave., N.W., Suite 302
Washington, D.C. 20036

International Institute for Environment and Development
Telex: 64414 Telephone: (202) 462-2298 or 462-0900

TESTIMONY
OF
LLOYD TIMBERLAKE, EDITORIAL DIRECTOR
EARTHSCAN
(PART OF THE INTERNATIONAL INSTITUTE FOR ENVIRONMENT & DEVELOPMENT)
BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT
OF THE
U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY

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Earthscan London Office: 3 Endsleigh Street, London WC1H 0DD, UK. Telex: 261681 Cables: Earthscan London WC1H Telephone: 01-388 9541

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Testimony of Lloyd Timberlake
The Crisis in Africa
Subcommittee on Natural Resources,
Agriculture Research, and Environment
October 23, 1985

Mr. Chairman and other members of the Subcommittee, I am honored and delighted at your invitation to participate in this important series of hearings on the African situation. I am the Editorial Director of Earthscan. I have previously served as a science editor for Reuters. I have lived in Africa and made numerous working trips as a journalist who is particularly interested in the problems of development.

In June of this year, Earthscan published a study of the current catastrophe in Africa (Africa in Crisis: The Causes, The Cures of Environmental Bankruptcy). Earthscan is an editorially independent news and information service on global issues of environment and development, and is part of the International Institute for Environment and Development, with offices in Washington, London and Paris. Our work is funded by a wide range of multilateral organizations and governments, including the U.S. government.

For 10 years now, Earthscan -- through briefing documents for journalists, books, a feature syndication service, and field trips and seminars for journalists -- has been trying to get across the message that "development" is impossible when accompanied by environmental decline. The crisis in Africa is the best -- but most tragic -- proof.

In our book, we were trying to get across ideas which many members of the public might have found startling, but which this subcommittee seems to have accepted as given: primarily that the crisis is not a single "natural disaster", but the end result of a long cycle of decline, lasting at least two decades.

We found that the reasons for this decline lay more in government policies than in nature. These policies are outside the scope of your hearings. But essentially, governments have tried to develop their nations by putting most of the development money and effort into cities. This has happened in countries where most of the people -- 75-80% -- live in the countryside and live off the land. Often, types of agriculture unsuited to African soils and climates were encouraged in Africa by experts who gained experience and training in Northern temperate climes. Often, what investment there was in agriculture was in cash crops, the value of which has been falling steadily in real terms. I do not intend to get into a "cash crops versus food crops" debate; the complexities of their interrelationships vary from nation to nation, even region to region. Let us agree on the obvious: cash crops have not brought Africa anything like prosperity and food crops have not provided Africans with anything like enough to eat. In a "normal" year, 100 million Africans are malnourished and severely hungry.

Earthscan looked hard at population and climate, but then so has this subcommittee, so I shall skip our findings on these issues. I will say -- and I believe it is relevant to this subcommittee's hearing today on technology -- that while concern over whether or not the climate is changing is of great scientific interest, it is beside the point of Africa's short-to-medium term recovery. If the climate is changing, more emphasis must be put on conserving topsoil and water, and on caring for the micro-climate in which crops grow, a few inches below the soil and a few feet above the soil. If the climate is not changing, then there will still be droughts, and precisely the same emphasis is required. Too much attention to climate is like trying to help the people of New York cope with winter by researching the root causes of winter.

We found the relations between the present crisis and the environment very complex. The policies of investing too little in agriculture meant investing too little in the agricultural environment: in the soil and water regimes. Farmers, unable to make profits from agriculture, are lured into cities, where the action is. There was neither the incentive nor the labor left in the countryside to invest in the laborious jobs of terracing or three-planting. Left alone in the countryside, peasants -- a great many of them women -- have been forced to take too much from their environment, putting too little back. Environmental resource accounts have been overdrawn; environmental "bankruptcy" has been the result in Ethiopia, much of Sudan, the Sahel, the South African bantustans (though in the bantustans the environmental bankruptcy has been directly institutionalized by the South African government).

"Desertification", that process by which good land is converted to wasteland due to overuse and misuse, is not only accelerating in the rainfed croplands and woodlands of the Sahel, but in the rangelands, croplands and woodlands south of that famine belt. Crop yields have declined over the past 20 years, in per capita terms, and in many areas in real terms.

Thus while in one sense environmental degradation is a cause of Africa's crisis, in another very real sense, it is a symptom of the mismanagement and misplaced priorities that are the real cause of the crisis.

All this may sound theoretical, but it is of the utmost importance to the deliberations of this subcommittee and to the efforts of organizations like the U.S. Agency for International Development in helping Africa to its feet. If environmental degradation is a symptom of mismanagement, then projects and technology to resuscitate that environment will not work unless that mismanagement is converted into effective management.

For example, it has been suggested that Kenya's needs for large maize imports in 1980 had nothing to do with bad weather. Farmers had planted less grain because in previous years, the grain purchasing bodies had not appeared to buy surpluses. High-yielding crops are of little use to farmers who either cannot get surpluses to market, or cannot get reasonable prices for grain which is sold.

Which brings us to another key point about environment and appropriate technology. Technology shoved into the African environment that is not based closely on what the farmers already know and are already doing will not work.

A report on British "integrated rural development projects" found that most failed because they were based on wrong assumptions about the farmers' problems and techniques. This was not a report by mavericks, but by two very senior, very worried officials of the British Overseas Development Agency.

This is a difficult point to get across, because one is immediately accused of romanticism, of converting the "Noble Savage" concept of the early 19th Century into the "Noble Peasant" concept of today. I do not believe that the African peasant is an all-knowing creature who would mesh perfectly with his environment if left alone. That environment is changing too quickly, for too many reasons, for the farmer to keep up with the game. But unless solutions are based on and in the farmers' culture, they will fail.

This should not have to be stressed in this country. Our own agricultural development owes much to the extension workers from land grant colleges acting as agents, not for Washington, but for the farmers themselves. They went out, talked to the farmers, learned their problems, took those problems to the researchers, took the answers back out to be tried in the farmers' fields, and then often repeated the process several times until things began to work. It took a great deal of such work before the emigrant farmers from Northern Europe learned how to make the most of our prairie soils and their special problems.

In Africa, extension workers, whether from Washington or from Lagos, tend to act more as salesmen for technologies developed in Arizona, or in India. One example: I found a sorghum in Wollo region in Ethiopia which matures in three months rather than the usual nine. It is much less vulnerable to drought, pests and disease because it is in the ground for a shorter time. The local farmers would not plant it, because they grow sorghum not only for the grain, but for the leaves for fodder and the stalks for building materials. The leaves and stalks of the new sorghum did not serve. USAID has helped to develop new strains of sorghum in the Sudan, both higher yielding and less vulnerable to drought. Early reports suggest that these are proving acceptable to farmers.

It is important to keep in mind that the African peasant is not slow to adopt things that do work. Hybrid maize was taken up by farmers in parts of western Kenya faster than it was taken up by U.S. farmers 30 years earlier.

There are signs that the "top down" approach to agricultural research is changing. The research centers of the Consultative Group on International Agricultural Research (CGIAR) show more willingness to study entire agricultural systems rather than just new strains of plants, and to spend more time studying these new strains in the fields of the farmers themselves.

There is a tremendous need for more research into unglamorous crop species which are little known outside of specific African regions: crops like "teff", the grain staple of Ethiopia; varieties of cassava and other tubers, odd legumes such as cowpeas and pigeon peas. Researchers have been slow to take up these causes because their published findings are unlikely to excite their colleagues -- or their funders. U.S. experience has shown that one of the quickest ways to make research reputable and exciting is to fund it. The committee's recommendations may encourage such funding.

But this and other sorts of agricultural development work take time, and the time frames of Northern aid agencies have always been far removed from the time frames on which the African agricultural environment works. Typical aid projects are based on contracts running two or three years. In the 10 years it takes a tree to grow, unirrigated, to useful size in the Sahel, many consultancies, contracts, projects and development fads and fashions will have come and gone in the region around that tree. The Swedish International Development Authority is running a much-praised soil conservation project which is alleged to have benefited half the farmers in Kenya. But then SIDA has been willing to put 10 years into that effort, changing and tuning as necessary. Few other aid agencies have been willing to make similar long-term commitments. Yet resuscitating the African environment, even a small bit of it in one nation, will involve precisely these long-term commitments. Subcommittee members will know better than I to what extent USAID will have to change its own policies to work over such periods.

All of these warnings about the many reasons technological fixes, no matter how "appropriate" they appear in Washington, may not work in Africa have been very negative. I make no apologies. These observations were inspired by the biggest disaster the planet has experienced since World War II. It is a very negative situation. I looked for good news to put into my Africa book, with little success. Experts in the various fields could not identify for me major, sustainable soil and water conservation or tree-planting projects anywhere in Africa that appeared capable of spreading.

But there are signs of hope, and aid agencies will have to be opportunistic in taking them up, because the lead, the hints that success is possible, will come first from Africa, and not from the North.

For instance, Northern institutions have been trying to put "improved woodburning stoves" into Africa for over a decade to save firewood and thus save trees. Much money has been wasted. Stove dissemination efforts began in the countryside, where wood is free. People had little interest in paying for a stove to conserve a free commodity. The stoves are either made of mud or of metal. If made of mud, they tend to deteriorate in a year or so and become no more efficient than open fires. If metal, they are too expensive; agencies cannot afford to give many away, and families cannot afford to buy them. Fires are free.

But then suddenly it was realized that tens of thousands of charcoal-burning "jikos" were being sold in Nairobi and other East African cities to people who pay heavily for wood and charcoal and want to conserve it. The jikos were little more than buckets with holes. Being uninsulated, they wasted heat and gave children, and cooks, nasty burns. The Intermediate Technology Development Group (ITDG) brought in an improved design from Thailand, which involved the insertion of a pottery liner into metal cladding. The improved jiko saves fuel and is safer. It is selling well, and its manufacture employs local artisans.

Researchers are taking a second look at old African techniques of agroforestry, of the sort practiced for hundreds of years by the Chagga people on the slopes of Mt. Kilimanjaro: food crops and fodder grasses on the ground, coffee above that, bananas the next step up, and above that valuable trees such as teak. These systems increase production per unit of area, reduce the risks of disease and pests, protect the soil against weeds and erosion and provide a continuing and varied supply of food and cash crops. But the labor involved in creating new agroforestry techniques will be tremendous, as no off-the-shelf solutions are valid for specific areas; each must be especially developed.

Some African societies have long practiced mixed cropping -- sowing several crops in one stand -- again to cut risks, increase overall yields per acre and discourage pests. Northern science has only recently -- after trying for decades to discourage it -- validated this approach and is seeking ways of improving it. "Alley cropping" is one neat variation, in which the main crop is planted in alleys between rows of leguminous trees or shrubs whose leaves are periodically slashed to supply nutrients to the soil. It is a soil management technique which can sustain crop production where farmers cannot afford fertilizer, and it is not radically different from many traditional systems. (Much of the work on alley cropping has been done at the International Institute of Tropical Agriculture at Ibadan, Nigeria.)

Organic farming in general, and all the no-till, residue recycling and mulching techniques which go with it, is rapidly becoming more fashionable among U.S. and European farmers. It offers hope for African farmers, who do not possess tilling tools, or soils which respond to tilling, and who can procure organic matter easier than they can chemicals. But it will have to be developed for specific locations and agricultural systems in Africa, probably where there are vaguely similar traditions on which to build.

Tradition was one of the bases for the take-off of soil and water conservation techniques which OXFAM has introduced into northern Burkina Faso. Many of these stem from low-cost techniques which the Israelis developed for the Negev desert, such as micro-catchment areas (shallow basins which focus scarce water onto a single tree or small area of crops). But the contour-damming techniques introduced were similar to ancient practices which had fallen into disuse in the area. These involve piling brush or mounds of stones only a few inches high along contour lines on relatively flat ground. Crops are planted on the high side of the "dams", where water is retained. The OXFAM innovation was the use of plastic hosepipes of water as cheap "surveying" tools to find the contours.

It is becoming clear that nomadic pastoralism may be the most efficient way -- perhaps the only way -- of harvesting resources over broad areas of resource-poor arid lands. Dryland range management has suffered particularly from agricultural development fads. In the past decade, many Northern aid agencies have gone from the extreme of trying to make the Sahel a "beef-basket" of the world to pretending that the nomads' herds do not exist, or blaming them for much of the desertification. I gather that USAID is now assembling a group of range management experts just to find out what is not known, but needs to be known, about African range management problems. This is a humble, but very realistic approach. Given the wealth of range management knowledge in this country, U.S. experts have much to offer -- if preconceived notions can be dropped.This committee has asked me here as a generalist, and as such I have given you a "shopping list" of ideas to pursue -- or not. But then I do feel strongly that no one approach will prove the salvation of African agriculture -- whether it be agro-forestry, or organic approaches or mixed cropping. Also, due to lack of time, I have left out knotty areas such as energy and irrigation, which I deal with in my book. I gather you have experts advising you in these fields.

I would like to recap with two almost contradictory points. Getting technology into Africa will be an opportunistic process, taking advantage of situations where what U.S. agencies want to do and can do match up with what African societies -- at national and local levels -- want to do and can do. Good opportunities will be relatively rare, so the U.S. agencies will have to rely much more than previously on the work of anthropologists and sociologists to keep them informed. Too often in the past, lack of good knowledge has hampered projects and caused their ultimate failure.

But once the opportunity is seized, it should not be abandoned lightly. Africa's slide into this crisis was a long, slow cycle of decline. It will take a long time to reverse the decline. Short-term fixes and sudden changes have been, and will continue to be, more a part of the problem than of any solution.

Mr. **Valentine**. Thank you, Mr. Timberlake, very, very much.

Do you have any comment that you would care to make or a solution or suggestions with respect to the question that I mentioned earlier today? As a practical matter, what do we do about governments that are involved? How do we really get started with this—these types of projects in that village in Ethiopia where those children have distended bellies, those still alive? How do we do that? Are we kidding ourselves? Is there any other way we can approach it, through some other government that is maybe not as ironclad or maybe as rigid as that government there?

What, in your opinion, is the solution to that problem? Because if it is a problem now when we ship grains and cereals and other foodstuffs to Ethiopia, isn't it a much greater problem when we attempt to deal with a long-range solution?

Mr. **Timberlake**. Well, I'm tempted to take Gus Speth's out and say that I'm not an expert on the politics of Ethiopia. Of course I would point out that it's been U.S. policy not to get into development activities in such countries.

I think that there're two points I'd want to make though. One, there's a debate about the conditionality of aid. I think it's worth saying that all aid is to a certain extent conditional, and any aid-giving nation has a certain amount of clout in bending, encouraging governments to change their policies. But I would also say—this is precisely your question. It has to do with what I was saying in that there are situations in which no technology and no aid are really going to work because conditions, political conditions often are so set against its working.

And this is often, this has happened so often in the Sahel in which people have gone into a village with excellent technology for stopping the movement of dunes into the farming area of that village, but it requires from the villages very hard work. And this has been resisted by the villages not because they're lazy, but because they are so far from markets they're able to produce nothing of value in those markets. So, they had much rather give up, abandon the village, and go into the capital. And in that situation it would be a case of putting money in and technology in where it can do no good, and it's this sort of thing that we've got to know before we try to get the technology in.

Mr. **Valentine**. Claudine.

Miss **Schneider**. Well, just to pick up on your point. A number of African nations now are beginning to decentralize their city centers, are they not, just for that purpose, so that there could be easier access to markets by the rural population? So, I think that that is a step that many African governments have seen to be necessary in order to feed their countries.

I would like to pick up on your testimony. You were generally stating that getting technology to Africa will be an opportunistic process, taking advantage of situations where what United States agencies want to do and can do match up with what African societies want to do and can, in fact, do. To what degree do you think that our AID Program allows for this approach? And one area that I would not like you to comment on, because I think we have that one in hand, is the area of resource management. There is one of the recommendations of our blue ribbon panel to suggest that there be some environmental assessment or not quite similar to but comparable to our environmental impact statements, so that when AID funds are being used for a major development program that we are assured that there is not just development but rather sustainable development by having an assessment of the impact.

So, are there some other areas where you think we can improve our AID program management in order to essentially fit what the African countries need?

Mr. TIMBERLAKE. Let me give you an example, and it's not fair because it's one example out of a large book. But when I was writing my book USAID sent me a good deal of material, and I found an energy project in Mali. And it was a two-phase project. The first phase involved putting in a lot of solar panels to electrify huts and clinics and schools and what not. And they also put in wind-driven electricity generators, a Chinese-style biogas digester. They covered these villages in Mali in technology. That was the first phase. The second phase, which when I read this report hadn't yet been begun, was a survey to find out what the energy needs of these villages were.

Now, this is not representative of USAID's work, but it was on the books and had been on the books for sometime and it apparently didn't cause an uproar when it written out and planned out in this way. And this is certainly not limited to USAID. The Overseas Development Administration of Great Britain looked at a decade's work of integrated rural development projects and found that perhaps the single greatest cause of failure was putting in new cropping techniques into systems in which the planners of the new didn't understand the reasons for the old. And it wasn't that they just didn't—these projects didn't work as well as could be expected because of this, they simply failed. It wasn't understood that people didn't follow apparently the best techniques of planting the millet at this time as they were advised to do, but instead they waited because it always hailed 2 months later. If you followed the expert's advice, you got your crop wiped out by hail. In another case they planted it at apparently the wrong time because they needed a harvest to pay laborers to pick another crop. Things like this.

And I think USAID, and others, will have to improve their knowledge of what the farmers are up to.

Miss SCHNEIDER. Very fine. Thank you. I'm afraid my time is up.

Mr. VALENTINE. Thank you.

Mr. Chairman.

Mr. SCHEUER. Thank you, Mr. Chairman.

I've enjoyed your testimony, and I will be submitting some questions in writing since our time is very short.

I noticed in your book that you did mention that Russia has been particularly reticent or disinterested in helping Ethiopia and other client states in Africa when they hit famine, and that it was only very ~~late~~ last year that finally, in a state of acute embarrassment over the much more forthcoming attitude of the Western donor countries, did the Russians come in with even a pittance of aid to Ethiopia.

How do you explain that? And what is the reaction of client states like Ethiopia, and South Yemen, and others to the fact that when they're really in the clutch the Great White—the Great Bear up there treats them with undisguised disinterest, and it's the Western democracies that they have been trashing at the U.N. and elsewhere that comes to their help in a humanitarian way? How do you explain all that, and what's their reaction?

Mr. **Timberlake**. I'll give you the unofficial and the official. The official Soviet explanation, of course, is because they were not the imperialist and didn't cause any of these problems. And of course the——

Mr. **Scheuer**. Say that again. I didn't get that.

Mr. **Timberlake**. The Soviet Union claims they were never the imperalist in Africa and didn't cause any of these problems, and therefore have no responsibility in cleaning them up. This is an argument not taken too well by their client states. I think the real reason, of course, is that it would be very difficult for the Soviet Union to send in a great deal of food aid into Africa and other areas.

Let me just——

Mr. **Scheuer**. Why is it any more difficult for them to send grain shipments in by boat than it is for us?

Mr. **Timberlake**. They tend not to have the grain.

Mr. **Scheuer**. Well, they're buying grain by the millions of tons all over the world, from Australia, New Zealand, Argentina, Canada, ourselves. They have the same availability to the world markets for grain as we do.

Mr. **Timberlake**. That's right. They're buying it with hard currency, whereas the Western nations are not doing that. I'm not making any excuses here, I'm just trying to——

Mr. **Scheuer**. Yes.

Mr. **Timberlake**. I think much more interesting is the reaction——

Mr. **Scheuer**. Yes.

Mr. **Timberlake** [continuing]. Of the client states.

Mr. **Scheuer**. Yes.

Mr. **Timberlake**. Now, last year I took 25 journalists into Highland Ethiopia, and we were trying to do everything we could to get on the good side of the Ethiopian Government. They were our host in this. And we said, look, we would like to invite a Soviet journalist. We were talking to the Ethiopian Relief and Rehabilitation Commission, and at this point—this was May 1 year ago—they said that if you invite a Soviet journalist he will not be allowed to tour this region because the Soviet Union has given us absolutely nothing in terms not only of relief but in terms of any sort of development assistance. And at this time all of the work, the excellent work, in terracing and reforestation being done in the Highlands was done with—from the United Nations World Food Program, a lot of that from the United States. And they said we simply don't allow Soviet journalists to tour this area.

So, there is a tremendous amount of anger on the part of the Ethiopians at the sort of aid they're getting from the state with which they've hooked up.

I would—if I could just add something to this, it was—Gus Speth was talking this morning about how the United States has security interest in long-term solutions in Africa, and 1974 I moved from the United States to England to work as a journalist there. U.S.

attention was focused on Watergate at that time. European attention, press attention, was focused on the famine in Ethiopia which Haile Selassie at that point was trying to cover up. The result of that famine, the result of that coverup, was that a long-term ally of the United States disappeared when U.S. attention was focused elsewhere. It's probably the best example of how this sort of disaster can overthrow a government seen a few years before that as reasonably stable, and I think that unless we can find long-term solutions this sort of power vaccums which we're seeing in Africa in one state after another, in Chad, in Angola, to a certain extent in Ethiopia today, are going to recur more and more and tend to draw in northern powers. And this, I think, would give this committee's work a certain impetus and a certain need for speed.

Mr. **Scheuer**. May I have unanimous consent to ask one additional question, Mr. Chairman?

Mr. **Valentine**. Without objection.

Mr. **Scheuer**. Thank you.

You mention in your testimony the importance of women as food producers in Africa, and my colleague, Congressman Claudine Schneider mentioned accurately that 60 to 80 percent of all the food is produced by women. It's—the food is raised by women, it's processed by women. Yet, the present laws and practices, both the national laws and tribal laws, relating to land ownership, to education, to training, to extension of credit, to availability of agricultural extension services of all kind, largely exclude women who are the food producers.

What—what is being done to change this and what do you think ought to be done and what could our Congress do to help move that process along?

Mr. **Timberlake**. Well, I'll start by saying it's—it's actually worse than you have painted it because this—the environmental aspects of this present crisis mean that women are having to work much, much harder to survive. I mean normally they are the hewers of wood and the drawers of water.

Well, now they've got to go further to gather the wood, they've got to go further to get the water and they've got to work harder.

Mr. **Scheuer**. Because of desertification and deforestation.

Mr. **Timberlake**. That's right. As I say, because of the environmental aspects of this crisis. So, they have got all the responsibility and more of the work for running these farms. In the meantime, the crisis is driving men into the cities. This is increasing the woman's workload and responsibility, but, as you say, she has got none of the power because she doesn't actually own the land and can't actually decide what to do with it.

Now, what has got to be done and what is very difficult to do is to draw women into these training schemes that are cropping up all over Africa such as one in Kenya whereby people are being taught how to manage their goats better. This is very important because the people there are too poor to have cows and goats can be very detrimental to the environment. They tend to eat everything growing, young trees, et cetera.

The word goes round that there is a training course in how to manage goats. People who show up are men. Back home it's the women who are managing the goats. And it can be one example after another all over Africa, so we've got to in our aid projects which involve training—we've got to somehow make sure that the women are involved in the training and education, and it's going to be difficult because it flies in the face of custom in Africa.

Mr. SCHEUER. I suppose you would say that women ought to be involved in the delivery of the agricultural extension services.

Mr. TIMBERLAKE. Oh, yes. In fact, in many of the Muslim countries, the males go out and try to talk to the women about how to use the firewood and whatnot, and the males are not allowed in the homes, they're not allowed in the kitchen so they can do very little good in reaching the people the resource about which they are trying to advise. It goes even more against the custom in many African countries to actually put women, educate women up to the point of being extension workers than it does to bring them into these rural education schemes.

Mr. SCHEUER. Thank you very, very, very much, Mr. Chairman. I thank the witness for his excellent testimony.

Mr. VALENTINE. Thank you.

Congressman Harry Reid from Nevada.

Mr. REID. Thank you.

Mr. VALENTINE. Mr. Timberlake, thank you very much for coming. We have a vote——

Mr. REID. Mr. Chairman.

Mr. VALENTINE. Yes.

Mr. REID. I wonder if—we have someone from Nevada on the next panel, and I have a statement to make and I'm late for something I had about 11:30, so I'm wondering if I can make a very brief statement——

Mr. VALENTINE. By all means.

Mr. REID [continuing]. Introducing that friend from Nevada.

Mr. VALENTINE. By all means. Proceed.

Mr. REID. Great.

Mr. Chairman, members of the committee, I really appreciate the leadership of you in calling this meeting. I think it's important also at this time, even though she is not here, to call attention to Representative Schneider for her initiative in this field. I think her interest is noteworthy in calling attention to the African drought tragedy that stands in the way of the African Continent's ability to develop with some stability.

But, more importantly, Mr. Chairman, I want to direct the panel's attention to Dr. Cynthia Irwin-Williams from the Desert Research Institute. The Desert Research Institute is a division of the University of Nevada. The work of the Desert Research Institute has contributed greatly to science generally. We're very really proud of the work that the Desert Research Institute has done in many, many different areas. I've worked with them on specific projects that this committee has been interested in, and I again stress how proud we are of them and the work that they do, with particular attention, however, today to the work of Dr. Williams in the field of water and particularly in water harvesting. She has shown the enormous potential for helping Africa feed itself. Her work deserves the support of this committee. I have read her testimony, and I think it's outstanding, and I look forward to working with the committee in trying to effectuate some of the things that she talks about.

Mr. VALENTINE. Thank you, Harry.

We have the panel, the promising technologies panel which remains to be heard from. We have a recorded vote and we'll stand in recess for 15 minutes.

[Recess.]

Mr. VALENTINE. The committee will please be in order.

This is the final panel, promising technologies panel, which consists, if you'll come around, ladies and gentlemen, please, consists of Dr. Cynthia Irwin-Williams, the executive director, Social Services Center, Desert Research Institute, University of Nevada and director after tomorrow, about whom my friend, Congressman Reid, spoke before we recessed. Also Mr. John Michael Kramer, program coordinator, renewable natural resources, CARE; Dr. James Kamusikiri—apologies for that attempted pronunciation—professor, California State Polytechnic University, director, Africa Tomorrow.

STATEMENTS OF DR. CYNTHIA IRWIN-WILLIAMS, EXECUTIVE DIRECTOR, SOCIAL SERVICES CENTER, DESERT RESEARCH INSTITUTE; JOHN MICHAEL KRAMER, PROGRAM COORDINATOR, RENEWABLE NATURAL RESOURCES, CARE, INC.; AND DR. JAMES G. KAMUSIKIRI, PROFESSOR, CALIFORNIA STATE POLYTECHNIC UNIVERSITY

Mr. VALENTINE. Doctor, let me extend my apologies by saying to you that my trade name is Tim Valentine; my real name is Itamus Thaddeus Valentine. [Laughter.]

So we have something in common. So if you would—some among—something among many things in common. So if you will proceed, the others would—it's customary, I think, for you to come up and sit at the table. Dr. Irwin-Williams in the center because that's where we've got the sign for you.

Dr. IRWIN-WILLIAMS. All right.

Mr. VALENTINE. And, Doctor, you over here, if you would summarize your remarks or otherwise proceed in any way you deem appropriate. We will accept and make a part of the record of this hearing your prepared statement. I'm going to try to conclude these hearings by 1:30 today. Glad to have you.

Dr. IRWIN-WILLIAMS. Thank you very much.

You've heard the several comments on appropriate technology and on the subject of water harvesting as an appropriate technology this morning. I'm going to address the problem more directly and indicate a particular project which we have on line for dealing with that in these remarks.

The region of Africa immediately south of the Sahara is known as the Sahel, and it forms a semi—an arid or semiarid band clear across the continent. Characteristically, it's received between 100 and 500 millimeters—that's 4 to 20 inches—of rainfall per year. Accordingly, this area must always be characterized as an area, by nature characterized by an inherently instable climate and an area which is subject to recurrent drought. This will recur over and over again. It's not unique to the midseventies and the mideighties.

Arid or semiarid ecosystems are intrinsically fragile and have low support capacity. The agricultural and pastoral techniques presently in use are generally relatively inefficient and in some areas land use practices are actively destructive. These factors have been compounded by historical and political events and have grossly been aggravated by recent severe droughts.

The cumulative result has been the rapid desertification or desertizing of huge areas of the Sahel, amounting to the loss of more than 10 million acres to the desert in the last 40 or 50 years. The recent drought has simply worsened the situation and brought famine and suffering to millions of people.

Of all of the basic needs and pressing problems faced by the people of Sahelian Africa, none is more crucial than the need for improved water supplies. As in all arid or semiarid environments, the ability to grow crops, to produce livestock, the means to combat desertification and even the ability to support minimum human life itself depend directly upon the availability of adequate water.

The resolution of this problem, using the most appropriate and most cost-effective technology, is the focus of my discussion. Working together with Africa Tomorrow, a nonprofit organization, the Desert Research Institute of the University of Nevada, in cooperation with the College of Agriculture of the University of Arizona and the Institute for Development Anthropology of Clark University in New York is developing a comprehensive program using very simply techniques for making best possible use of scarce water resources. These techniques are cumulatively termed water harvesting. They require little or no capital investment, can be employed by untrained people using only hand tools, are sustainable over a long period of time with low maintenance, and can be integrated into a wide variety of different subsistence and economic situations.

Indeed, this simple technology provided the subsistence basis for major ancient biblical civilizations in the Middle East and before the use of steel tools people like the Nabateans and in the Southwestern United States the Chacoans, but they've been recently overshadowed by more elaborate and more costly reclamation schemes.

We believe that the introduction or reintroduction of these simple ideas into selected parts of arid Africa will enable the people there to emerge from the present crisis with important new tools to feed themselves and their families and to achieve an increasing degree of economic self-sufficiency.

In contrast with many of the attempts at assistance and technology transfer over the past decade, we believe that this technology is both appropriate to the environment and appropriate to the cultures of the people and can be integrated into the solution of the wide range of subsistence and economic problems.

What then are we talking about by water harvesting technology? Water harvesting may be defined simply as the capture of rainfall which is normally wasted on nonproductive areas such as stony hillsides and its concentration in other areas for utilization for productive purposes. The basis of water harvesting is the fact that although rainfall is low and infrequent in arid regions it does, indeed, produce a considerable amount of water. Even one-tenth of an inch—that's 2.5 millimeters rain—of a rain shower can produce 1,000 to 2,000 gallons of water per acre if efficiently managed and harvested.

By capturing and concentrating this rainfall, water harvesting can provide the moisture necessary for small- to medium-scale agriculture, for forage enhancement, for stock raising and as a source of potable water for people and animals. Rainwater harvesting is possible with as little as 50 to 80 millimeters of rainfall a year. That's 2 to 3 inches of rainfall a year, although optimum condition is between 250 and 600 millimeters, that is, 10 to 24 inches. Above 750 millimeters, that's 30 inches a year, the technique is usually unnecessary and is not very efficient except as a safety mechanism, a buffer in drought years such as we recently experienced.

The fine grain, loose type soils which are present in most deserts are ideally suited for rainwater harvesting because even a small or even after a small rainfall they form a relatively impermeable smooth crust that promotes runoff of the water for capture.

Water harvesting techniques include basically one or more of the following elements. Rainfall runoff from a relatively unproductive or donor area, termed a catchment, may be increased or controlled by very simple techniques like rock and gravel clearing, clearing or changing the existing vegetation, land smoothing, removal or piling up of gravel, slope changing, construction of small dikes or berms and soil compacting. All of these activities simply increase the amount of water that runs off and can be captured.

Water may then be diverted, conveyed by diversion dams and canals and stored in surface or subsurface reservoirs such as were referred to earlier. These are sometimes called sand dams.

The uses of harvested water in agriculture may vary from very large catchment systems of over 100 acres designed to water relatively large fields to microcatchments as small as 16 meters square designed to water a single valuable plant such as a fruit tree. A wide variety of fruits, such as peaches, apricots, grapes, nuts, including almonds and pistachios, grains such as barley, wheat, promullet and forage crops such as alfalfa and wild oats, have been successfully grown based entirely on runoff agricultural techniques.

Naturally or artificially seeded forage can be improved several folds in recipient areas of water harvesting systems. Stock may be watered at tanks, at shallow wells or at artificially produced sprays using rainwater harvesting. Antidesertification measures include making harvested water available to increase ground cover, provide water for tree breaks, et cetera.

The present world leaders in water harvesting research are the United States, Israel, and Australia. In addition, there are numerous very small and very successful projects in Africa, India, Central America, and elsewhere which are sponsored by state governments, private volunteer relief agencies such as the Peace Corps and Oxfam, and even by private industry as well as in some areas some surviving preindustrial ethnic groups who still use the technique.

Although there is an adequate research base and numerous successful local applications of water harvesting, no large-scale attempt has ever been made to use this technology to resolve regional rather than local problems of subsistence insecurity and the need to improve agricultural and stock productivity. We believe that such a larger scale program of application of water harvesting technology has the potential for making a substantial impact and for providing at least a partial solution to the problem of water scarcity in the arid Sahelian region of Africa. Such a program should be based on a solid foundation of information on local conditions, rainfall, amount and periodicity, geology, surface soils, topography, and vegetation.

At our own initiative and at our own expense we at the Desert Research Institute at the University of Nevada have already undertaken preliminary studies of this kind for the Sahel and have determined that acceptable and even excellent conditions exist over wide areas. Together the Desert Research Institute at the University of Nevada and the College of Agriculture of the University of Arizona have developed extensive experimental and training programs in water harvesting technology. We then can provide the full range of technical expertise necessary to carry out the essential local analysis and to design and implement a larger program.

In addition, in order to avoid repeating past errors before they occur, it must be recognized that the other vital element in any program involving technology transfer is that it be truly appropriate to the recipient culture and be capable of being integrated so as to achieve a maximum impact and a maximum information diffusion with, at the same time, a minimum dislocation of that culture and that environment.

This requires an understanding and appreciation of the real economic needs of the people, the adaptability of their culture to the new technology and an identification of culturally acceptable mechanisms for information diffusion and acceptance. In this area we have been in contact with the Institute for Development Anthropology of Clark University in New York, which has developed specialized personnel and capabilities in this area and we believe can greatly assist us in maximizing the impact of this kind of technologic improvement.

Thank you.

[The prepared statement of Dr. Irwin-Williams follows:]

WATER-HARVESTING: A LOW TECHNOLOGY SOLUTION TO WATER SCARCITY

submitted by:

AFRICA TOMORROW,
A Non-Profit Corporation

and

DESERT RESEARCH INSTITUTE,
University of Nevada System

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The Problem

The region of Africa immediately south of the Sahara known as the Sahel forms an east-west belt across the continent. It comprises parts or all of 16 countries, including Cape Verde, Chad, Djibouti, Ethiopia, Gambia, Kenya, Mali, Mauritania, Niger, Nigeria, Senegal, Somalia, Sudan, Uganda, United Republic of Cameroon, and Upper Volta.

About 80% of Sahelian Africa is considered to be arid or semi-arid. Accordingly this must be recognized as an area characterized by inherent climatic instability which is subject to recurrent drought. Arid/semi-arid ecosystems are intrinsically fra~~gile and~~ have low biomass support capacity. Agricultural and pastoral techniques presently in use are relatively inefficient and in some areas land use practices are actively destructive. These factors have been compounded by historical and political events and have been grossly aggravated by recent severe droughts. The cumulative result has been the rapid desertification of huge areas of the Sahel, amounting to the loss of 5 million hectares to desertification in the last 50 years. The present drought has exacerbated the situation and brought famine and suffering to millions of people.

Of all of the basic needs and pressing problems faced by the people of Sahelian Africa, none is more crucial than the need for improved water supplies. As in all arid/semi-arid environments, the ability to grow crops, to produce livestock, the means to combat desertification, and even the ability to support minimum human life itself, depend on the availability of adequate water. The critical nature of water as the primary limitations factor for human occupation of the Sahel, has been tragically demonstrated by the impact of the recent droughts. The resolution of this problem, using the most appropriate and most cost-effective technology, is the focus of the current discussion.

Working together with Africa Tomorrow, a non-profit organization, the Desert Research Institute (a division of the University of Nevada), in cooperation with the College of Agriculture of the University of Arizona, and the Institute for Development Anthropology of Clark University of New York, is developing a comprehensive program using simple techniques for making the best possible use of scarce water resources. These techniques cumulatively termed water harvesting require little or no capital investment, can be employed by untrained persons using only hand tools, and can be integrated in a variety of different subsistence and economic situations. This simple technology provided the subsistence base for major ancient civilizations in the Middle East (e.g. the Nabateans) and the Southwest United States (e.g. the Chacoans) but recently has been overshadowed by more elaborate and costly reclamation schemes. We believe that introduction of these ideas into selected parts of arid Africa will enable the people there to emerge from the present crisis with important additional tools to feed themselves and their families, and to achieve an increasing degree of economic self sufficiency. In order to best understand the relevance of this kind of program and the associated technology, it is essential to review briefly the record of past attempts by the international community to improve conditions in Africa.

The Assistance Record Numerous attempts have been made by various groups (e.g. the UN), private and public agencies (e.g. OxFam, C.A.R.E., the Peace Corps) and countries, including the United States to reverse these trends and to provide solutions to the problems. Many of the most spectacular and costly have failed entirely. Failure in most cases is attributable to 1) high operating costs such as dependence on costly fuel and fertilizer etc.; 2) unavailability of key elements (e.g. wood, replacement parts); 3) absence of requisite transportation-marketing infrastructure; and 4) absence of local technical and management expertise to sustain the projects. Many of these large scale schemes were developed in the context of and with assumptions based on Western European-American market based economics. They did not address explicit needs of the African population, and were often inadequately integrated into the existing social and economic framework. at the opposite extreme are a large number of small projects developed by the private volunteer organizations (PVO's), which have focused on specific relatively low cost improvements of very local problems. The record is uneven, but some of these have been quite successful. However given the scale of the problem as a whole, their impact has been necessarily limited. Projects involving demonstration and training centers have had limited success, due to unplanned-for variability of local conditions, lack of even small amounts of funds for local capital investment and the difficulty in providing convincing motivations for local populations to adopt new techniques.

The result of these well-meant activities, except for specific local successes, has been a net negative impact. This is particularly significant in terms of the decreasing willingness of local populations to experiment with new techniques. At present however this trend is offset by the very real crisis presented by the widespread drought of the early and middle 1980's.

It is clear that new programs introduced henceforth must adequately address several key issues which may be subsumed under "appropriate technology transfer".

1. The technology must be of direct benefit to the recipient population.
2. The technology must be appropriate to the environment.

3. The technology must be appropriate to the recipient culture so that it can be sustained over the long term. Particularly important is that the technology be within the capital and labor means and within the technical and management capabilities of the culture.
4. The technology should be capable of being integrated into the recipient culture without major dislocation. It should be recognized that this will have distinct implications for sedentary (agricultural) as opposed to pastoral (stock raising) populations. It will also have distinct implications in terms of products that require transportation, marketing, etc.
5. The new technology must be demonstrable and must have potential for expanded impact beyond the demonstration site(s). Mechanisms for realizing that potential must be identified.

It is believed that the widespread application of the group of techniques cumulatively termed water harvesting can provide at least a partial solution to the problem of critical water shortage in many parts of the Sahel. In addition it is believed that this technology is both appropriate to the environment and to the cultures of the people and can be easily integrated into the solution of a wide range of subsistence and economic problems.

Technical Solutions to Water Scarcity

There are many techniques used for manipulation and acquisition of water for human use. On the "high-tech" end of the spectrum, they include creation of vast lakes, importation of water through pipelines, desalinization of sea water, large scale projects which divert rivers and

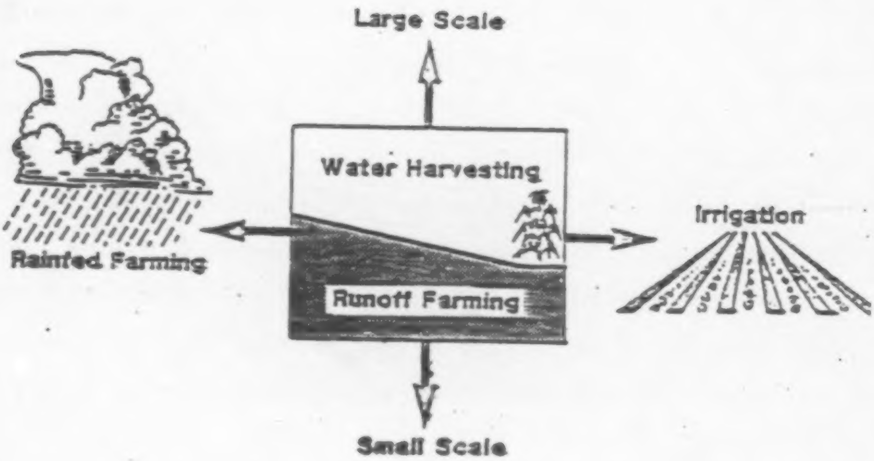

Large Scale
Water Harvesting
Runoff Farming
Rainfed Farming
Irrigation
Small Scale

Figure 1. Water harvesting and runoff farming lie at an intermediate point between rainfed farming and irrigation and between large scale and small scale systems.

tap deep aquifers for human needs. Unfortunately, as has been repeatedly demonstrated most of these techniques cannot be applied to the Sahelian situation because they depend upon continued availability of high cost resources such as fuel and hardware. Many water providing schemes (deep wells, for example) also provide water only at specific points, and so concentrate the impact of people and their stock upon the area immediately surrounding the water source. In the total spectrum of water management methods, water harvesting falls near the low end technologically, requiring only hand tools and human labor, and provides comparatively more modest amounts of water widely distributed over the landscape (Figure 1).

Water Harvesting: The Technology

A. What is Water Harvesting?

Water harvesting may be defined as the capture of rainfall normally wasted on non-productive areas and its concentration for utilization on productive crop or forage land, for storage as potable water, or for other useful purposes. Water harvesting and runoff agriculture involve relatively low cost, low maintenance techniques which have been in use for thousands of years.

The basis for water harvesting is the fact that, although rainfall is low and infrequent in arid regions, it can yield a considerable amount of water. Even ten millimeters (.4 inches) of rainfall distributes 100.000 liters (or .1 cubic meter) of water per hectare. A family of 6, with camels, sheep, dogs and a donkey need about 18 cubic meters of water per year, so a single ten mm rainfall efficiently harvested from 180 hectares (445 acres) could supply a herding family's water needs for a year. Similarly, water harvesting can provide the moisture necessary for small and medium scale agricultural production. Millions of hectares can be made more productive than they are today. The ability of the local peoples to create and maintain a viable and relatively stable economy can be dramatically increased. A water harvesting system can be built by hand and once installed will, with relatively little maintenance, provide water without requiring fuel or electric power.

Rainwater harvesting is possible with as little as 50-80 mm (2 to 3 inches) average annual rainfall, but optimum conditions are between 250 and 600 mm (10 and 24 inches). Above 750 mm (30 inches) per year, the technique is usually unnecessary and is not efficient, except as a buffer in drought years. Loess and loess-like soils, present in most deserts, are ideally suited for rainwater harvesting because even after a small rainfall they form a relatively impermeable crust that promotes runoff.

B. Techniques Used in Water Harvesting

Water harvesting techniques include one or more of the following elements. Runoff from a relatively unproductive donor area, termed a catchment may be increased or controlled by rock and gravel clearing, clearing or changing the existing vegetation, land smoothing, removal or piling of gravel, slope changing, construction of dikes or berms, or soil compacting. Water may be diverted, conveyed by diversion dams and canals, and stored in surface or subsurface reservoirs. Infiltration in cultivated or forage areas may be increased by plowing, ripping or otherwise loosening the soil, spreading dams, devices to channel water to deep root zone, leveling or terracing to increase infiltration opportunity time, and soil modification (e.g. mulching and or adding organic matter).

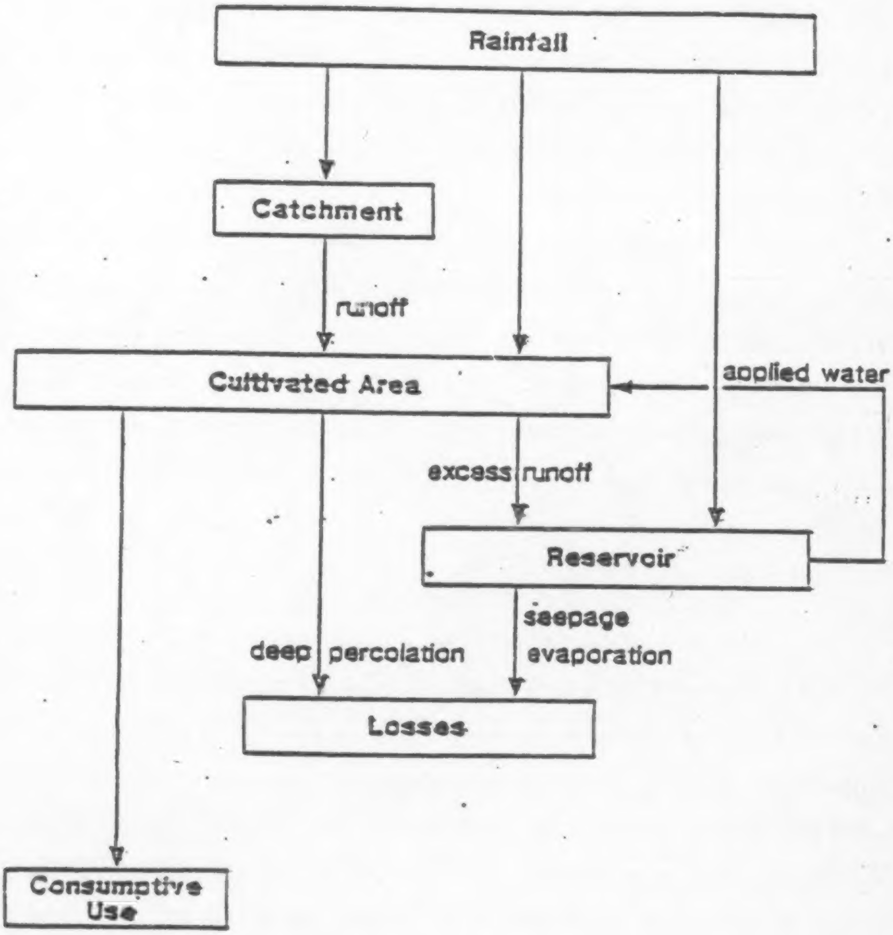

Rainfall
Catchment
runoff
Cultivated Area
applied water
excess runoff
Reservoir
seepage
evaporation
deep percolation
Losses
Consumptive Use

Figure 2. Flow diagram for water harvesting/runoff farming systems.

C. Principal Types of Water Harvesting

Catchment Harvesting

In catchment harvesting a donor catchment area is modified so as to provide maximum controlled rainwater runoff contributing to a recipient collecting area in which crops, pasture or storage facilities are concentrated. (Figure 3). Catchment surface modifications to decrease permeability and increase runoff include clearing away rock, gravel and vegetation, and compaction of the surface. These are usually used in conjunction with control of water flow through the use of ditches, terraces, berms, rock walls, flow gates, etc.

Water Diversion

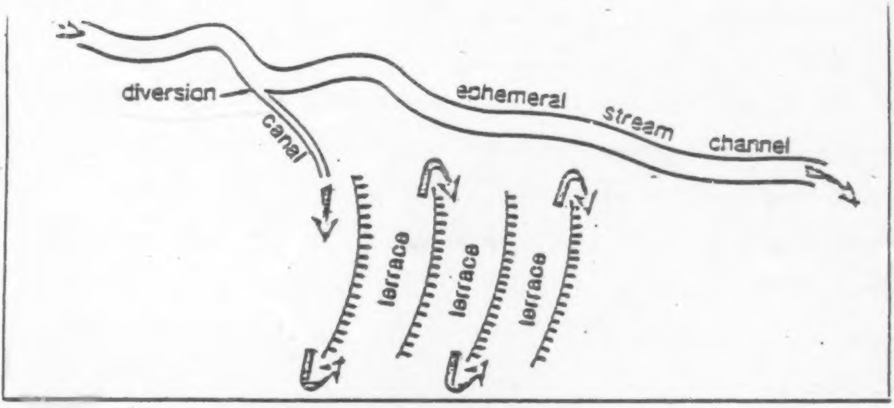
Water from ephemeral flows can be diverted from existing channels to nearby crop or forage areas or to storage facilities. Water distribution is controlled by a system of diversion dams, ditches, border dikes and terraces; these structures also serve to inhibit erosion.

Water Spreading

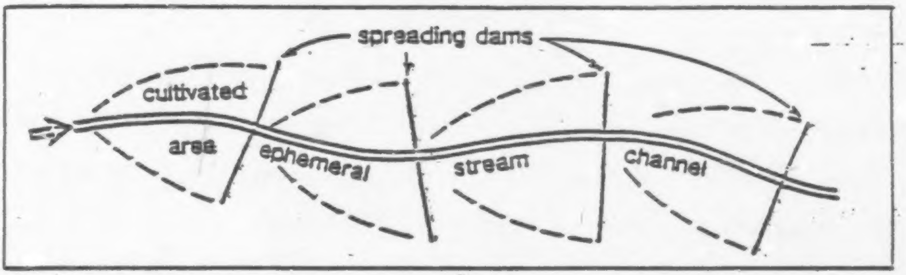
In water spreading, water from ephemeral flows and floods which usually drains away in gullies and is lost, is diverted and spread over the adjacent floodplain, where it can be used for crop or forage production. (Figure 3). Water is diverted or retarded by ditches, dikes, small dams and brush fences.

Microcatchment and Contour Catchment Harvesting

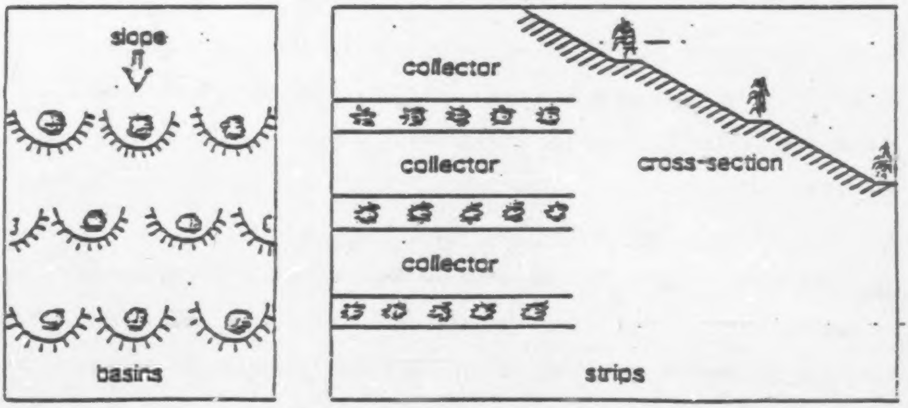
Water from a small bounded and modified catchment (microcatchment) may be concentrated to enhance the production of a single (or small number of) valuable plant resource(s). Micro-catchment surfaces may be modified to decrease permeability and/or increase slope. At the lowest point a basin is excavated; the soil of the basin is loosened or mulched to increase water penetration and improve fertility. Microcatchment sizes may range


diversion
canal
ephemeral stream channel
terrace
terrace
terrace

a. Diversion/terrace system


spreading dams
cultivated area
ephemeral stream channel

b. Water spreading


slope
collector
collector
collector
cross-section

basins

strips

c. Microcatchments

Figure 3. Types of Water Harvesting/Runoff Farming Systems.

from 16 m^2 to 1000 m^2. Contour catchment water harvesting provides a series of sloping terraces modified to shed water onto adjacent strips of productive soil. A series of contour terraces are easily constructed on hillslopes, with gates so that excess water is progressively shared downslope. Artificial slopes may be made on level terrain by mounding soil between the strips.

Artificial Springs

A natural drainage way may be excavated to a shallow depth, and the basal soil compacted, sealed or lined with relatively impermeable substance. This will keep the natural moisture from sinking deeper and seeping away. The drainage may then be refilled with sand or gravel, and a well or spring pipe put in place, which will make available all of the moisture entering the drainage.

D. Utilization of Water Harvesting Systems

The water provided by a water harvesting system may be used for runoff agriculture or forage enhancement, it may be used for antidesertification measures, or it may be stored for drinking water for humans or animals. Uses in runoff agriculture may vary from large catchment systems (up to 500 ha.) designed to water relatively large fields (up to 50 ha.), to microcatchments as small as 16 m^2 designed to water a single plant. Types of runoff agriculture are based on methods of water harvesting, e.g. water spreading, microcatchment, contour terrace agriculture. Crops are chosen for rapid maturation, drought resistance, salt tolerance, and are adapted to specific type of runoff system. A wide variety of fruits (e.g. peaches, apricots, grapes), nuts (almonds, pistachios), grains (barley, wheat, pearl millet), and forage crops (alfalfa, wild oats) have been successfully grown with runoff agricultural techniques. Natural or artificially seeded forage can be improved in recipient areas of water harvesting systems, employing catchment harvesting, water spreading contour terracing, etc. Stock or wildlife may be watered at tanks or shallow wells. Antidesertification measures include making harvested water available to increase ground cover, provide water for tree breaks, etc.

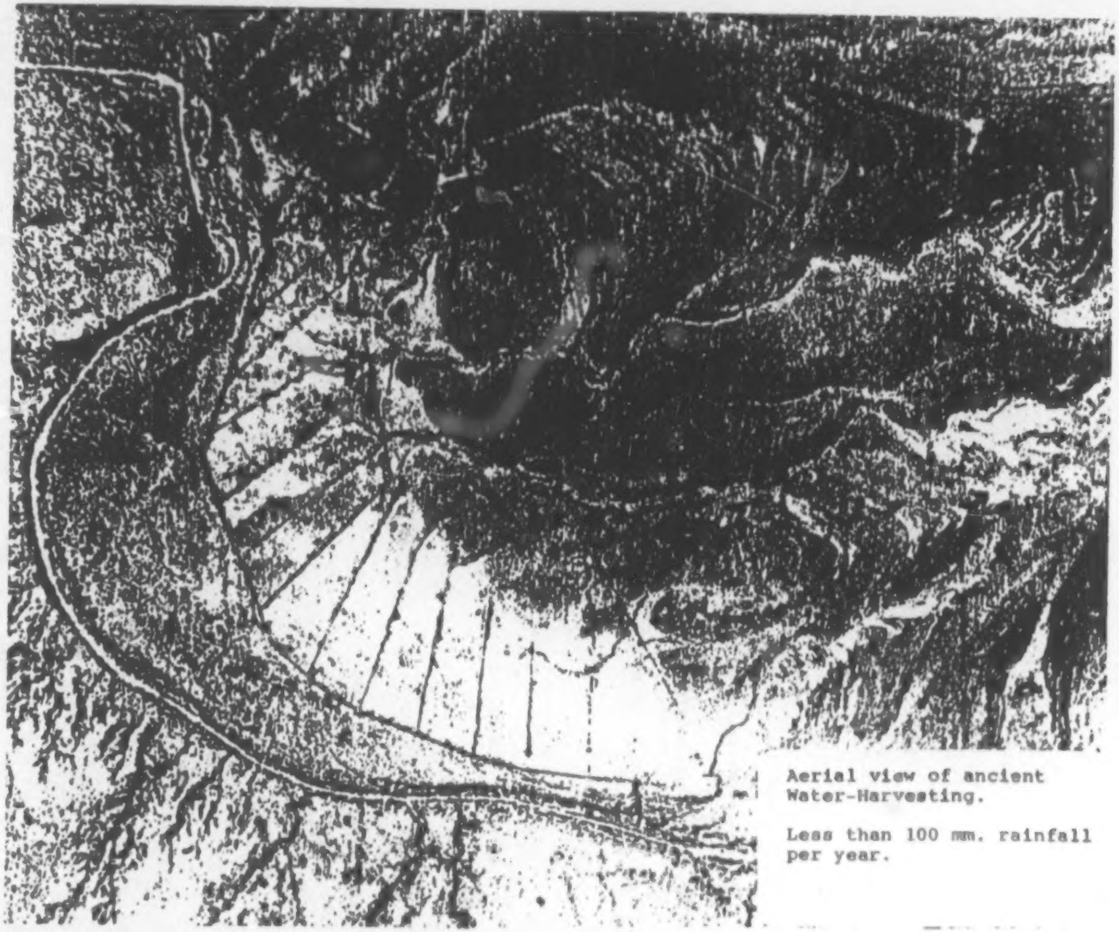
To store water for human and stock consumption, the storage facility must deal with evaporation and seepage. The least costly storage facility, which also effectively deals with evaporation, involves sand-filled reservoirs. Seepage control requires lowering the permeability of the storage facility lining, e.g., by soil compacting.

E. Present Use of Water Harvesting

Present world leaders in water harvesting research are the United States, Israel and Australia. In addition there are numerous small scale projects sponsored by State governments, private volunteer and relief agencies, (Peace Corps, OxFam) and private industry, as well as some surviving pre-industrial ethnic groups who still use the technique. In western Australia asphalt/concrete catchments provide water for whole towns. Elsewhere in Australia water harvesting has been used for concentrated forage production and combined with scheduled grazing plans to increase livestock production several fold, while at the same time assisting in anti-desertification effort. Wildlife managers in the western United States use runoff diverted into underground tanks to water game birds. In the Sudan and South Africa sand dam water storage is practiced. In Botswana, Mexico, India, Pakistan and Australia and Southwest U.S. small scale microcatchment agriculture has been successful. In Niger, water spreading has been used for forage improvement, and in India, pitcher irrigation is an established technique. Despite these varied, small scale applications of water harvesting, no large scale attempt has been made to resolve regional (rather than local) problems of subsistence insecurity and need to improve agricultural and stock productivity.

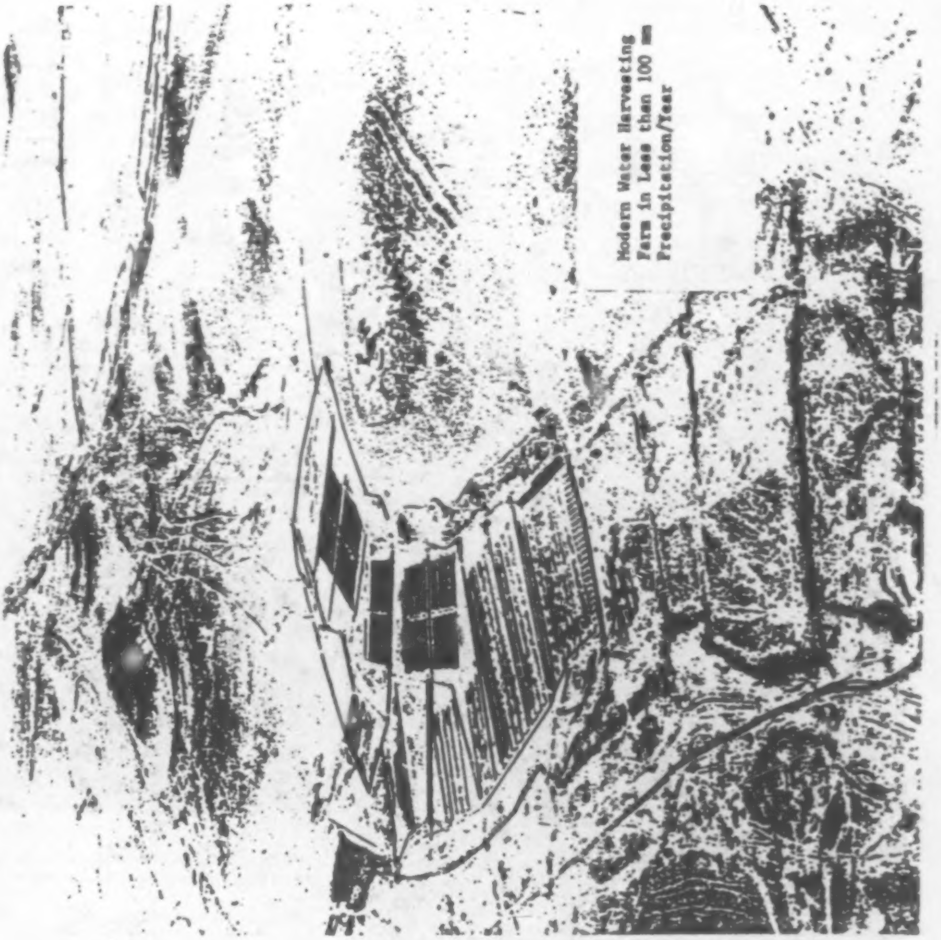
We believe that a larger scale program of application of water harvesting technology has the potential for making a substantial impact and for providing at least a partial solution to the problem of water scarcity in the arid Sahelian region of Africa. Such a program should be based on a solid foundation of information on local conditions (rainfall amount and periodicity, geology, surface soils, topography and vegetation). We have already undertaken preliminary studies of this kind for the Sahel and have determined that acceptable and even excellent conditions exist over wide areas. The Desert Research Institute of the University of Nevada and the College of Agriculture of the University of Arizona have developed extensive experimental and training programs in water harvesting technology. They can provide the full range of technical expertise necessary to carry out the essential local analysis and to design and implement the larger program.

In order to avoid repeating past errors, it must be recognized that the other vital element in any program involving technology transfer is that it be appropriate to the recipient culture, and be capable of being integrated so as to achieve maximum impact and information diffusion with minimum dislocation of the culture. This requires understanding and appreciation of the economic needs of the people, the adaptability of the culture to the new technology and identification of culturally acceptable mechanisms for information diffusion and acceptance. The Institute of Development Anthropology (Clark University, New York) has developed specialized capabilities in this area and can assist in maximizing the impact of technologic improvement.



Aerial view of ancient Water-Harvesting.

Less than 100 mm. rainfall per year.

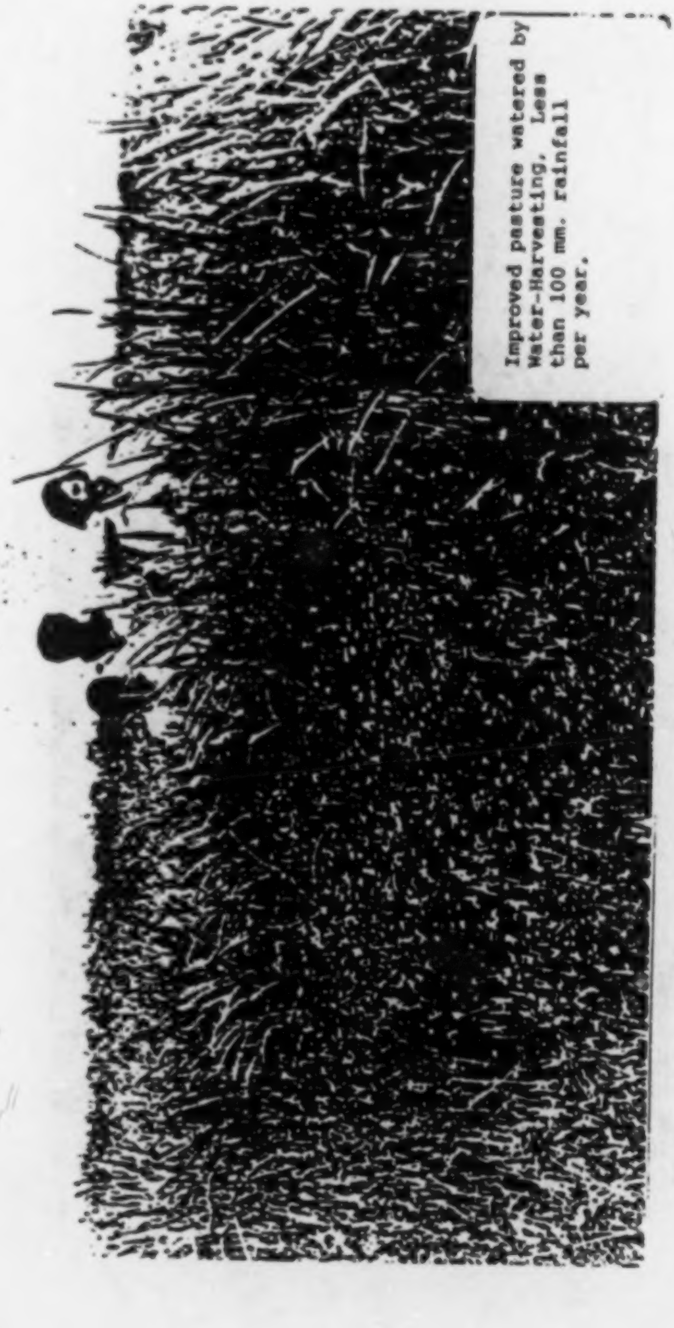


Modern Water Harvesting
Farm in Less than 100 mm
Precipitation/Year

Measuring flow rate on a modern experimental Farm.

Water-Harvesting can produce a surprising amount of water.

Barley Field Watered Entirely by Water Harvesting in Less than 100 mm Precipitation/Year



Improved pasture watered by Water-Harvesting. Less than 100 mm. rainfall per year.

Sheep in Improved Pasture
Watered by Water Harvesting
in Less than 100 mm
Precipitation/Year

Fruit orchard watered entirely by Water-Harvesting

Less than 100 mm. rainfall per year.

Mr. VALENTINE. Thank you, Dr. Irwin-Williams.

Dr. Kamusikiri.

Dr. KAMUSIKIRI. Mr. Chairman, members of the committee, I would like to say that I'm not a biophysical scientist or an agronomist, but I am a social scientist and an African who grew up in part of the tribal region, who saw degradation and agricultural decline, has almost become irreclaimable. And some of the things I'm going to be sharing with you will be relating to my own experience as well as my own studies.

Mr. VALENTINE. Let me—I don't want to be—I want to have an opportunity to listen very carefully to what you have to say, and we have another recorded vote. You see how hard we work for what you pay us.

Dr. KAMUSIKIRI. OK.

Mr. VALENTINE. So I'm going to find out what it is; and we'll just recess and then I'll come straight back.

Dr. KAMUSIKIRI. OK.

Mr. VALENTINE. If I can't—I have resisted these other votes. I have resisted two times; then I can't resist a third time telling you this oldest story about the Congress, I suppose, about the bells ring and the lights flash. There's a recorded vote, and I'm told two ladies were seated in the gallery here some years ago, and they heard the bells ring outside, you know, and they were looking down on your Congress in action; and they heard all these lights flash and heard the bells and one said to the other, "Well, I wonder what that is?" The other lady looked down and she said, "I don't know, maybe one of them is trying to escape." [Laughter.]

[Recess.]

Mr. VALENTINE. The committee will be in order.

Dr. KAMUSIKIRI. Mr. Chairman, I sort of halfway lost my voice, so if I sound like I'm not speaking loud, I don't mean to. I will try to go slow so that between my accent and my voice, everybody can understand. Appreciate.

Mr. VALENTINE. Doctor, we'll be OK. We both have an accent.

Dr. KAMUSIKIRI. Thank you.

Today the severity of Africa's food shortages and deterioration of its biophysical systems represents perhaps the most critical development challenge facing the international community. It ensures not only whether alternative strategies and technologies of combating Africa's ecological degradation exist, but also whether National Governments and international assistance agencies can readjust their policies and commit the essential resources for the development of a long-term, holistic, self-regenerative economic base on the Continent of Africa.

In order to fully understand the causes of Africa's biophysical degradation and decline in food production, it is essential first to examine the changes in African farming patterns and demography. In the past, most African agriculture consisted of a complex interactive mixture of crops, livestock and trees. This contrasts sharply with, of course, the monocultures on which most of the world's present agricultural production is based and which African farmers have recently, of course, been encouraged to do or to adopt since the colonial presence.

For centuries then, African pastoralists had achieved a delicate balance between people, livestock and the marginal ecosystems that they exploited. Having accumulated remarkably precise and complete knowledge of animal husbandry and their local biophysical systems, these pastoralists were able to achieve and maintain this equilibrium by diversifying their herds so that each of the different animal species had different water and herding requirements. Morever, African systems of shifting cultivation and the multiple cropping ripples are reflected—a very, very thorough knowledge of the local ecological conditions and an effective social structure in terms of their labor organizations. They could rate, because of this knowledge, the fertility of a piece of land and its sustainability or suitability for one or more of their crops by the physical characteristics of the soil and the vegetation which covered that soil. They also could assess the staying power of a soil and the length of time for which the land must be rested before satisfactory results, of course, could be obtained again.

Moreover, their vocabulary consisted of the many, many names of hundreds of trees, grasses and other plants, but they could identify particularly, you know, any very specific vegetative pest. They could also identify crop diseases by specific terms and characteristics.

What I'm saying is that the Africans themselves have a tradition of a knowledge of their ecology and of having lived with an ecology that was balanced, sustainable and that they exploited with tremendous sensitivity.

I do believe that has to come into the picture when you are seeking to discuss the solutions for Africa. But despite the ecologically sensitive systems of African agricultural production, the funding systems which evolved in response to the rapid demographic changes, climatological variations, the introduction of monocropping and inappropriate modern technologies such as heavy machinery, chemical fertilizers and pesticides during the last several years triggered an irreversible and self-reinforcing biophysical degradation.

Almost everywhere, Mr. Chairman, the ravaging effects of overgrazing, overcultivation and persistent drought have resulted in massive soil erosion which has caused yields to decline sharply. In 1973, for example, after six years of drought, Lake Chad was one-third its normal size. The Niger and the Senegal Rivers failed to flood, leaving the agricultural areas of Niger, Burkina Faso, Senegal, Mali and Mauritania unwatered and arid.

In the northern Sahel, pastures totally disappeared. Standing water was depleted and there was a widespread loss of scattered trees and shrubs which had once served to stabilize the arid ecosystems.

In its reports of 1977, the United Nations estimated that during the last 50 years about 650,000 square kilometers of once productive and ecologically balanced land along the southern border of the Sahel had become desert. In the coastal regions of West Africa, the moist forests were being cleared by conventional loggers and subsistence farmers at the rate of five percent per year. This dramatic destruction then that has caused a disaster today is the one for which we need to suggest some approaches to resolve.

What I would like to indicate is that there are several technological options and farming strategies that we can utilize for improving the continent's biophysical systems and enhancing its agriculture.

Fundamental to Africa's long-term development strategy are the needs for soil fertility improvement, land and water management and crop improvement. Insofar as Africa possesses enormous biophysical and climatological as well as crop variations, it is recommended that the most appropriate technologies are those which reflect a complementary synthesis of indigenous innovations and those developed elsewhere.

A long neglected, but potentially effective method of soil fertilization is the system of African traditional agroforestry which is still being practiced among the Chagga in Tanzania today. This technique involves the relay cropping system or the cropping of leguminous fodder crops with full cash crops or the integration of tree and crop production. Through this traditional or tradition of intercropping, many Africans were able to increase overall production per unit area, to reduce the incidence of disease and pests, to exploit the different heights of crops, to protect the soil against weeds and erosion, and to provide a continued and varied supply of food.

During the past decade the International Institute of Tropical Agriculture in Nigeria gave attention to the study of what is known now as low cost minimum tillage and another system known as the no-till system for humid areas in Africa. What this does is that, of course, the no-till method involves planting directly into a stubble mulch and using herbicides for weed control.

Its advantages are that it can reduce soil erosion or losses down to nearly zero. It also can increase cropland capacity to absorb and retain water and, of course, more importantly, it generally outyields the conventional tillage systems in conditions that are moisture, temperature and nutrition stressed. By eliminating plowing and keeping continuous cover, the no-till systems also maintain organic matter through the use of mulch.

Recent studies on land and water management in the semi-desert areas also suggest that there are—the use of, or what you can say is the intervention of the use of tied ridges, mulching, contour-budding, and various watershed-based management systems.

Of course, of special significance is what my colleague here, Dr. Irwin-Williams, has just stated. I would say that there is also one more fundamental weakness in our attempts to approach African agriculture. That is the lack of emphasis within the international agricultural research community, lack of emphasis on research on stable food crops. Until recently, the international agricultural research community grossly ignored African food crops. Instead, they concentrated on either improving no food cash crop yields or adapting foreign crops into Africa. In the semi-arid tropics, for example, moderate yield increases could be achieved through breeding for seedling vigor, through drought resistance research, and the resistance to the most common pests as well as diseases. Some research needs to be done in that area.

Then the development, of course, of the various crop variations that are needed in the different agro-economic characteristics of Africa could involve the development of shorter crop cycles and modified plant structures could also be increased. It increases the farm management options by the farmer.

Among the indigenous African food crops whose full potential has not yet been significantly explored are the fonio and the iburi. Both of these grains cannot only be grown on poor soils but they are also resistant to local pests and diseases. Likewise, the teff, a high-yield protein, millet-like cereal, which is a widely cultivated grain, of course, in Ethiopia, has virtually exhibited no serious scientific study.

The subject, of course, of appropriate technology with which to combat African biophysical systems and degradation of agriculture really present a tremendous challenge as well as a dilemma to us. To this effect, appropriate technology as perceived by Africa Tomorrow, is the technology that is best suited to local, cultural, environmental, economic, political and social conditions at the site of application. The design and the adaptation of such technologies includes, of course, an examination of such factors as the user's preferences for technology as well as the user's needs for conserving natural resources. How this can easily be adapted? How also it can be afforded? How it can fit into the established cultural standards? How it can be compatible with the local labor skills? And how it can enhance the social and biophysical fabrics of that society?

Due to the adverse economic, social, and biophysical effects that have resulted from the ill-conceived, massive transfer of agricultural equipment, chemicals and foreign crops into Africa, it is Africa Tomorrow's view that the technology transfer process must ensure that the science and the technology to be transferred are capable of enhancing local development infrastructures rather than mere flow of technology from developed to non-developed countries.

What I would like to say here is to emphasize this. I indicated already, Mr. Chairman, that I'm not a biophysical scientist nor an agronomist. My experience—being born in a village where we could not produce enough for my family to send me to school; I was also fortunate, or unfortunate, to be caught, in the 1960's, in one of the biggest winds of change in Africa. It was the change for liberation. I learned that freedom from colonialism and the need for equality and justice and the need to fight for the dignity, these are the social aspirations of all our people. I sang many songs of freedom. I sang "Uhuru," "Kwacha," "Pamberi ne Kusununguka"—various languages of expressing the need for freedom.

Throughout Africa we sought the unity in order to harness our human and natural resources for the total advancement of all our people in all spheres of human endeavor. Yet, today, Mr. Chairman, the pursuit for freedom, the pursuit for equality, justice, and dignity has been tragically undermined by the ravaging ecological degradation, by hunger, by drought and by despair.

What Africa needs today is the freedom from hunger, the freedom from diseases. And we are seeking the understanding of your committee, Mr. Chairman, and of all people of good will, and of your Government to join hands with Africa Tomorrow, with the Africans and in this context saying together, Africa is here. As the young people and the young nations are struggling to find a meaning, to find a direction, rather than nitpicking about what they lack, what they don't know, we need to show them what we can do.

We need to hold hands with them and help them to achieve the human dignity.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Kamusikiri follows:]

APPROPRIATE TECHNOLOGY FOR COMBATTING AFRICA'S BIOPHYSICAL DEGRADATION AND DECLINE IN FOOD PRODUCTION: PRESENTED ON BEHALF OF AFRICA TOMORROW TO THE U.S. HOUSE OF REPRESENTATIVES-COMMITTEE ON SCIENCE AND TECHNOLOGY, OCTOBER 23, 1985

By James G. Kamusikiri

The question of appropriate technologies for improving Agricultural production and combatting droughts and desertification in Africa has recently become the subject of numerous books and international conferences. Today, the severity of Africa's food shortages and the deterioration of its biophysical systems represent perhaps the most critical development challenge facing the international community. At issue is not only whether alternative strategies and technologies of combatting Africa's ecological degradation exist, but also whether national governments and international assistance agencies can readjust their policies and commit the essential resources for the development of a long-term, holistic and self-regenerative economic base on the continent.

In order to fully understand the causes of Africa's biophysical deterioration and decline in food production, it is essential to first examine briefly some of the changes that have taken place in African farming systems and demography. In the past, most of African agriculture consisted of a complex, interactive mixture of crops, livestock and trees. This contrasts sharply with the monocultures on which most of the world's present agricultural production is based, and which African farmers have recently been encouraged to adopt. For centuries, African pastoralists had achieved a delicate balance between people, livestock and the marginal ecosystems they exploited. Having accumulated remarkably precise and complete knowledge of animal husbandry and their local biophysical systems, these pastoralists were able to achieve and maintain this equilibrium by diversifying their herds, so that each of the different animal species had different water and herding requirements. Moreover, African systems of shifting cultivation and multiple cropping reflected a thorough knowledge of local ecological conditions and an effective system of farm management. They could rate the fertility of a piece of land and its suitability for one or more of their crops by the physical characteristics of the soil and the vegetation which covered it. They also could assess the staying power of a soil and the length of time for which the land must be rested before satisfactory results could be obtained again. Moreover, their vocabulary consisted of the names of hundreds of trees, grasses and other plants, and they could identify particular vegetative pests and crop diseases by specific terms and characteristics.

However, despite this ecologically sensitive system of agricultural production, the farming systems which evolved in response to rapid demographic monocropping, and such inappropriate modern technologies, as heavy machinery, chemical fertilizers, and pesticides, during the last several decades, have triggered an irreversible and self-reinforcing biophysical destruction.

Almost everywhere the ravaging effects of overgrazing, over-cultivation and persistent drought have resulted in massive soil erosion which has caused yields to decline sharply. In 1973, after six years of drought, Lake Chad was one-third its normal size. The Niger and Sengal rivers failed to flood, leaving the agricultural areas of Niger, Burkina Faso, Senegal, Mali and Mauritania unwatered and arid. In the Northern Sahel, "pastures disappeared, standing water was depleted and there was a widespread loss of scattered trees and shrubs" which had once served to stabilize the arid ecosystems (Owen, Dennis, 1979).

In its reports of 1977, the United Nations estimated that, during the last fifteen years, about 650,000 square kilometers of one productive and ecologically balanced land along the southern border of the Sahara had become desert. In the coastal region of West Africa, moist forests were being cleared by commercial loggers and subsistence farmers at the rate of five percent per year (Hogberg 1985). Such destruction of tree cover has also been a major contributing factor to Ethiopia's current famine crisis. While less than a century ago about fifty percent of Ethiopia was covered by various types of forests and grasses, by 1960 this had dropped to about fifteen percent of the land area. At the present moment only slightly more than three percent of Ethiopia's surface is still covered by forest (Hogberg 1985).

Today, approximately eighty percent of the Sudano-Sahelian region's total land area is either arid or semi-arid compared to a world average of only thirty-three percent (Hogberg 1985).

Aggravating these conditions are the facts that Africa's population is now twentyfold per century, and that, in many African countries, livestock numbers have exceeded the carrying capacity of the land by fifty to one hundred percent (Brown and Wolf 1985). Causing even greater threat to Africa's agricultural potential has been the shrinking genetic base of its indigenous crops. The continuing extinction of hundreds of indigenous grain varieties, the loss of pest resistant hybrids and the fact that no major breakthrough has yet been achieved in the genetic improvement of key staple crops, have all placed enormous constraints on African agriculture. To that effect, many African farmlands have only bare rocks left, and the denuded countrysides can no longer sustain the rapidly increasing populations.

Against this disquietting background, many development experts have debated the merits of their particular approaches and technologies towards resolving Africa's current food crisis. In its reports: *Accelerated Development in Sub-Sahan Africa:* An Agenda For Action (1981) and *Progress on Development Prospects and Programs* (1983), the World Bank was optimistic that African agriculture could be improved simply by adopting the Green Revolution model which enabled India's agriculture to emerge from a deficit to a surplus sector of the national economy. While impressive, the Indian "green revolution" does not, however, offer a viable solution to Africa's agricultural crisis. In the first place, the complexity of, and great variation in African farming systems associated with differences in the biophysical and socio-economic conditions limit the effectiveness of implementing technologies developed under non-comparable conditions. Second, the "green revolution" in India involved primarily two commodities -- rice and wheat -- which were almost entirely grown by irrigation (Malton and Spencer, 1984).

In Africa where soils tend to be far more fragile than those in India, where a large variety of crops are grown and the potential for irrigation is extremely limited, the applicability of the key techniques developed in India is indeed very minimal. For example, although the total annual rainfall in the semi-arid tropics of West Africa and India are similar, the growing season in Africa is shorter. Moreover, African soils tend not only to be shallower, but also to have lower water-holding capacities than comparable Indian soils (Norman 1985). The technological implications of these soil and climatological differences are even more substantiated by the recent discovery that only two out of two thousand Indian sorghum and millet varieties which were imported for trials in the mangrove swamps of West Africa performed as well as the best local varieties (Norman 1985).

More recently, a great deal of attention has been given to Farming Systems Research as a means of increasing the relevance of research to the needs of small farmers. This approach emphasizes on-farm innovations adapted to local conditions and capable of being used efficiently by small farmers (Mellor and Johnson 1984). This is particularly significant since in many African countries, profitable technological innovations suited to the needs of small farms have not been available. In giving priority to small scale, labor-intensive, low-cost and farmer-adapted technologies, however, special care must be taken not to dichotomize the issue into a choice between small and big technologies. The point is that, the determining factor of appropriateness is not so much the size per se, as it is the functional relevance of a given technology in meeting specific development needs, problems, conditions and priorities of a particular community.

TECHNOLOGICAL OPTIONS

Having indicated some of the basic problems concerning Africa's food crisis, I wish now to suggest some possible technological options and farming strategies for improving the continent's biophysical systems and enhancing its subsistence agriculture. Fundamental to Africa's long-term development strategy, are the needs for soil fertility improvement, land/water management, and crop improvement. In so far as Africa possesses enormous biophysical, climatological and crop variations, it is recommended that the most appropriate technologies are those which reflect a complimentary synthesis of indigenous innovations and those developed elsewhere.

A long neglected, but potentially effective method of soil fertilization is the system of African traditional agroforestry which is still being practiced among the Chagga tribes people of Tanzanya (Brown and Wolf, 1985). This technique involves the relay-cropping of legumenous fodder crops with food or cash crops, or the integration of tree and crop production (Brown and Wolf, 1985). Through this tradition of intercropping, many of Africans were able to increase overall production per unit area, reduce the incidence of diseases and pests, exploit the differenct heights of crops, protect the soil against weeds and erosion, and, provide a continued and varied supply of food (Brown and Wolf, 1985).

During the past decade, the International Institute of Tropical Agriculture in Nigeria gave much attention to the study of low-cost minimum tillage and no-till systems for humid and sub-humid areas (International Institute of Tropical Agriculture, 1981). The no-till method involves planting directly into a stubble mulch and using herbicides for weed control. Its advantages are that it can reduce soil losses to nearly zero, and increase cropland capacity to absorb and retain water. More importantly, it generally outyields the conventional tillage systems in conditions that are moisture, temperature and nutrition stressed. By eliminating plowing and keeping continuous cover, the no-till system also maintain organic matter through the use of mulch.

Recent studies on land/water mangement in the semi-arid zones also suggest the use of interventions which include tiered ridges, mulching, contour budding and various watershed-based management systems. A specific example is the small-scale rock based water harvesting system which is gaining international attention as a means of reclaiming highly eroded regions (Timberlake, 1985). Another method of combatting desertification in Africa is a comprehensive approach conceived as a mosaic of activities which include reforestation, sand-dune fixation and controlled grazing projects.

One of the most fundamental weaknesses of African agricultural research is its lack of emphasis on staple food crops. Until recently, the international agricultural research community grossly ignored African food crops. Instead, they concentrated on either improving no-food cash-crop yields, or adapting foreign crops into Africa (Timberlake, 1985). In the semi-arid tropics, for example, moderate yield increases could be achieved through breeding for seedling vigor, draught resistance and resistance to the most common pests and diseases. The development of crop varieties with different agronomic characteristics such as shorter crop cycle or modified plant structure could also increase farmers' management options.

Among the indigenous African food crops whose full potential has not yet been scientifically explored are the fonio (digitaria exiles) and the iburi (digitaria iburna). Both these grains cannot only be grown on poor soils, but they are also resistant to local pests and diseases. Likewise, the teff (eragrostis abyssinia) a high protein millet-like cereal which is a most widely cultivated grain in Ethiopia has received virtually no serious scientific study (Timberlake, 1985).

The subject of appropriate technology with which to combat African biophysical degradation and improve agricultural production represents therefore, both a dilemma and a challenge in that it amplifies the failures of past development approaches while at the same time it provides us an unprecedented opportunity to define and establish a more comprehensive technological base for suitable agriculture. To this effect, appropriate technology as perceived by Africa Tomorrow is the technology that is best suited to local, cultural, environmental, ecomonic, political and social conditions at the site of application. The design and adaptation of such technology includes an examination of such factors as user's preferences for technology that conserves natural resources, can be easily maintained, can fit into the established cultural standards, is compatible with local labor skills, and enhances the social and biophysical fabrics of the site of application. Further, due to the adverse ecomonic, social and biophysical effects that have resulted from the ill-conceived massive transfer of agricultural equipment, chemicals, and foreign crops into Africa, it is Africa Tomorrow's view that the technology transfer process must insure that the science and technology to be transferred are capable of enhancing local development infrastructures, rather than consisting of a mere flow of technology from developed to developing countries (Lagos Plan). It is in the context of these principles therefore, that in our search for appropriate and desired technology options we must be concerned with those technologies that are location specific, can utilize indigenous resources, can meet specific needs, problems and conditions, and are cable of strengthening the indigenous scientific and technological base.

10

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Mr. **Valentine**. Thank you, Doctor.

Mr. Kramer.

Mr. **Kramer**. Thank you, Mr. Chairman.

I assure you my remarks will be brief. I have prepared a written statement which, with your permission, I would like to enter into the record. My oral statement will summarize key points in this written document, and go on to address two issues which I think are key to the committee's consideration of the topic of Africa, environment, and development.

Agroforestry in Africa today is an appropriate technology. It is a technology that has been practiced for hundreds of years, and that is underway today in fairly significant size. It is a proven technology. By agroforestry we mean the combination of trees, annual crops, and/or animals on a given piece of land. Why agroforestry you may ask? One reason is that the every tree planted in Africa today there are 29 trees that are cut. According to FAO every drought-affected country in Africa is suffering from moderate to severe fuel wood shortages.

But more than that, trees rehabilitate soils for agriculture. They provide fodder for animals, medicine for sick children, tools for workers, and so on. Agroforestry, as I mentioned, is not a new practice. Probably since the first farmers planted seed, wild-grain seed, they have been planting them in connection with trees.

CARE's practice of agroforestry, however, is to take the smallholder farmer from a passive role of allowing trees to coexist with his agricultural pursuits to an active role of actually seeking out and planting appropriate species.

In the year ending June 30, 1985, CARE in 11 countries throughout Africa planted some 3.7 million seedlings for about a cost of a dollar a tree. This is 10 times more than we planted 4 years ago. The costs are, we think, a bit high still but they will be reduced as the projects mature and the per tree initial capital investment is spread over a longer period.

Our goal in Africa in tree planting is to create self-supporting nurseries and farmer awareness and continuing practice of agroforestry. We think there are several keys to successful agroforestry projects, and I might add I believe that these can be extended to just about any development project, be it in Africa or in the United States.

First, you need the trust of the people. It is very difficult for us to imagine how it seems for a black-African community that's been isolated for years to suddenly see a trail of dust and land rover pull up and three white people get out. Well, let me tell you it's quite astounding. The people of that village will extend their most courteous hospitality. I can tell you from personal experience that Africans are among the most hospitable people in the world. They will entertain you; they will talk to you for hours on end. And if you offer them the prospect of a project, they will probably nod their heads in total agreement. Yet when you walk away, there remains a suspicion that these white people that got out of the land rover weren't really bona fide types, that were just going to drop around once every 6 months or so to see how things are going and leave that village burdened with yet another project that probably won't work.

No. The projects that we undertake must be undertaken by Africans themselves. All we can do is provide some financing to get the thing rolling, some technical assistance and training to leave a cadre of workers there with the skills and a little bit of financial resources to undertake their own projects.

That brings me to the second key to successful projects, and that is community participation. Local solutions must have locally—there must be created local solutions to locally identified problems. This has been repeated throughout today's testimony, and I want to iterate here that it is perhaps the most single important thing that we can do in our development efforts.

Third, you must have the support of the host country government, and I'll be happy to tackle the question on Ethiopia if you like. Host country governments are the only effective way of continuing and replicating projects around the country. We cannot stay there forever. USAID nor the World Bank can stay in a country forever. It must be the host country government that takes the responsibility for replication. Now, there is good governments and there's bad governments in Africa, but, nevertheless, you have to work with what you've got. And Ethiopia is a case in point.

Fourth, we have to come up with simple but effective technical interventions. The water harvesting techniques that have been mentioned today are one. Tree planting, I submit, is another; but they have to work. It doesn't do any good to talk in economist terms about an eight percent internal rate of return. To a farmer to risk a new intervention, you have to talk in the range of a 50 to 100 percent return on investment to make it worth his while to take that risk. So it has to be effective and it has to be low cost to reduce the risk.

And, finally, and I think this is something that may fall on very fertile grounds here in Congress and under the current administration, the projects we offer must be locally owned and the participants must receive direct benefits from the projects, not trickle down. We're talking private sector; we're talking entrepreneurial skills and capitalism, and I think this is the key to successful tree planting. In the past trees were planted by government projects in large fenced-off plantations, and the people were viewed at worse as a nuisance and at best as a source of labor to run those plantations. Unfortunately, it's all too easy for a farmer to clip a fence and let in his herd or to throw a match over the fence and let the plantation burn. Because I can just about guarantee you, there is no land in Africa that hasn't been used by somebody for something; and if you come in and establish a large plantation, you're usurping somebody's usufruct rights, and they'll do everything in their power to make sure that they get their rights returned to that land.

The reason those large plantations didn't work is because the people viewed those plantations as a state good or perhaps even sometimes as an official assistance agency project for which the agencies—the people certainly would never receive the benefits.

In CARE's approach we provide direct benefits to the people. We make it very clear to them that they own the trees, that they have to protect the trees, that if they want to let the goats eat them or fires burn them down or chop them down before they're too—while they're too young, then that's their prerogative. They can do that.

Finally, to go on to my issues very quickly, the first, I think, is a very important issue that Congress needs to address is one of absorptive capacity. How much money can we put into Africa and effectively spend at the same time? I submit to you that the absorptive capacity is there, particularly if you choose to work through private and voluntary organizations such as CARE. For one, let's look at the bottlenecks that are potential and with regard to absorptive capacity. One is human resources. If you could see my desk, it's littered with resumes of qualified young people from the University of Auburn in the case of aquaculture, from Arizona, Yale and others in the case of forestry. I have approximately 20 resumes for every one position I have open. There is no shortage of qualified, and most of these people have two years of experience from Peace Corps which I commend as probably the best program the U.S. Government is funding in international development, and they are capable and willing to go out and work in the difficult situations that we have to work in.

Second, models. Models of projects do exist. CARE has 13 projects in 11 countries in Africa today. We are adding new ones. Some of these projects I presented in my case—as case studies in my paper and I submit to you that they can be replicated.

Third, community-based works by using the wealth of local skills and time that they have available to them can make it possible to replicate these projects. There are, to be sure, shortages in terms of absorptive capacity of some of our host country governments. But we can fill those gaps, and through the generous assistance of agencies such as the Ford Foundation, the Rockefeller Foundation, USAID and others, we can train the nationals while we are filling that gap with Peace Corps volunteers and other expatriate staff as well as local talent.

Finally, what can Congress do to support these types of initiatives in Africa? I would submit that there are three things that Congress can do that it has in front of it today.

One is the bill, H.R. 2782, presented by Congressman Gilman, which appropriates $75 million of new money for just these types of activities in Africa. I urge your support for this bill.

Second, Interaction, the coalition of voluntary agencies working in international fields, has prepared an African initiative. I urge you to take a look at this initiative, consider it and its implications. It is a costing proposal involved, but I think it may well be worth your while to consider it.

And then, finally, the Environment and Energy Study Institute congressional agenda, I was a member of the task force and I fully hope that you will consider their recommendations as well.

Thank you.

[The prepared statement of Mr. Kramer follows:]

AGROFORESTRY IN AFRICA

Testimony Provided to the U.S. House of Representatives

Committee on Science and Technology

Subcommittee on Natural Resources, Agriculture and Environment

October 23, 1985

by: John Michael Kramer
Program Coordinator
Renewable Natural Resources
CARE
660 First Ave
New York, NY 10016

Dr. Phillip Johnston
Executive Director

AGROFORESTRY IN AFRICA

Agroforestry: An Appropriate Technology

There is a growing body of evidence that solutions to the problem of sustainable rural development in drought-affected Africa can be found. This testimony, provided to the House of Representatives by CARE, will demonstrate that successful models of long-term solutions to drought-induced famine do exist and can be implemented if the political will and funding are found.

One of the most important lessons that can be drawn from the recent cycle of drought and famine in Africa is that viable long-term development depends on sustainable utilization of natural resources. Nearly 80 percent of all Africans live in rural areas. The vast majority of these are smallholder farmers, dependent upon the fertility of soil and annual rains for the few meager sacks of grain that keep their families alive.

In arid and semi-arid regions of Africa, the soils quickly lose the ability to support crops if improperly managed. This process, known as desertification, when combined with the inherent variability of rainfall in these areas, can quickly set the stage for the disasters that occurred in the early 1970's and again in 1984. Beyond crops, human welfare depends on perennial trees, shrubs, and grasses that, while less susceptible to poor soils and rainfall variation, are nonetheless readily degraded by grazing animals, the expansion of cropland, and fuelwood harvesting. These perennials provide fuelwood for cooking meals, poles for home building, leaves for sauce, medicine, and animal feed, and fruits which are as essential to survival as food.

Agroforestry is an appropriate technology that can turn back the trend on environmental degradation and consequent human suffering in Africa. If widely adopted, it could significantly increase the the likelihood that Africa will reach the goal of food self-sufficiency.

Agroforestry is the integration of forestry and agriculture. It combines tree-growing with production of agricultural crops and, in some agroforestry systems, grazing by domestic livestock, simultaneously or sequentially on the same unit of land. It is an appropriate technology with the objective of creating sustainable land management strategies which increase the overall yields of land, and which are also compatible with the environment and local cultural practices.

Properly applied, agroforestry is a system that is both productive and environmentally sound and it has the potential not only to increase food, fuel, and income for farmers or herders on marginal lands, but also to help stop the destruction of the world's forested lands.

Agroforestry is especially suited for small farms. Because international Private and Voluntary Organizations (PVOs) have historically worked closely with such farming communities in less developed countries (LDCs), it is not surprising that many PVOs have adopted agroforestry as a core intervention for their rural development programs. PVOs typically base their development projects on local direction and community participation.

Because their approach is small scale, they have the flexibility needed to meet specific community desires. As a result, the majority of the agroforestry project models currently being developed come from PVOs.

CARE has been a leader among PVOs in introducing agroforestry; indeed CARE's agroforestry program is the largest of any international PVO. In Africa, CARE supports thirteen agroforestry projects in eleven countries. Last year our projects in Africa planted over 3.7 million seedlings produced in approximately 730 nurseries at a total cost of $3.8 million. Over 40,000 farm families have participated. We believe these projects provide useful models for replication on a much larger scale. With modest amounts of additional funding for expanding agroforestry practices and the support of official assistance agencies in policy formulation and institution building, recurrent famine and environmental degradation can be slowed. If similar developments occur in sectors such as irrigation, range management, aquaculture, and family planning, desertification can be halted.

The Smallholder Farmer: Her Problems

The small farmer in Africa is most often a woman. Not only does she have responsibilities in caring for and feeding her family, hauling fuelwood and water, and tending the home compound, but she also does most of the subsistence agricultural work. It is difficult for western peoples to understand the depth and breath of the difficulties she must face every day. This section will attempt to provide a brief picture of the problems she has with her crops and animals. Clearly, no single description is capable of capturing the diversity of farm life in Africa, however,the amalgam presented below should serve as a stage for understanding the role of agroforestry on the smallholder farm.

The smallholder farmer has usage rights (rarely clear title) to one to ten acres of scattered plots. These may include permanent garden plots adjacent to the home compound, annually manured fields farmed on a nearly permanent basis, and bush fields that are fallowed after a relatively short period of cultivation. She may own a small number of livestock, particularly small ruminants such as goats. In arid and semi-arid lands the principle staple crops are millet and sorghum. Cash crops, such as cotton, are grown on better sites. Seasonally, fruit and vegetables are obtained from the garden. Livestock are an important source of income and social prestige while less important as a source of protein. Trees, while sometimes common in her landscape, are rarely planted.

Our farmer rises before dawn to start a fire for breakfast, a rough gruel and a glass of tea. She may then send her children or go herself to fetch water from the nearest well (often quite distant). She may send another child out to herd the livestock. If she is running low on firewood, she will take a machete or small hand ax and, in the company of a group of neighboring women, set out for a day-long trip to gather dead branches and twigs. For a few weeks after the harvest, she is be saved this arduous task by using the dried stalks of the staple grain crops for cooking. If the fuelwood supply is ample, she may spend the bulk of her day in the garden or the fields tending crops with a homemade hoe. Near dusk she will return to relight the fire and cook a dinner similar to break--fast with the addition of a few of her homegrown vegetables and, rarely, meat. She retires early to her bedroom, a small corner of her one-room home separated from the rest by a curtain.

Too often her day is interrupted by the need to care for a sick child and, when severe illness strikes, a long journey to the nearest health clinic. Market days are full of excitement. She may take a portion of her garden crop or an animal to sell or trade for the few items that she does not produce herself such as soap, candles, salt, or medicine.

If she is fortunate and her husband is an oldest son, the farm was probably passed down to her husband by his father. If, however, her husband has three or four brothers, the holding that was adequate for her father-in-law's family would not serve all the sons. The land would have been broken up among the older brothers, their younger brothers forced to seek a new piece of bush to clear and farm. The newly cleared fields are located on less productive soils. If she married a younger son, she will have to work even harder to gain her family's subsistence.

Because the land she tends is less than she actually needs to grow enough food for her family, she finds that, with time, her crop yields are diminishing. In effect, she has exceeded the carrying capacity of the lands she controls. The carrying capacity of a natural system is the amount a system can yield (for consumption by animals and/or humans) without impairing its future ability to support a maximum number of living organisms.

Carrying capacity is a function of technology; it can be altered by man (or nature in the case or long-term climatic change)either up or down. The traditional agricultural systems practiced by our model farmer have not been able to keep pace with the burgeoning population of Africa. In the arid and semi-arid belt immediately below the Sahara, nearly half the land has populations at or in excess of its carrying capacity.

What actually happened as our farmer exceeded her land's carrying capacity? To examine this, we must first break down the total carrying capacity into its component parts: crops, livestock, and forests. The carrying capacity for each is quite distinct. For example, according to World Bank estimates, the total population of the Sahelian zone is equal to the carrying capacity for crop and livestock systems while the zone's population exceeds by seven times the carrying capacity for fuelwood.

The cropland carrying capacity for dryland farming is a function of soil and climate. Climate is essentially an uncontrollable variable; soil is highly subject to human influence. When fields are stripped of perennial vegetation and farmed constantly, soil fertility drops rapidly. The soil loses its organic material and hardens. Rainfall runs off over the surface rather than infiltrating, further exacerbating the problem by causing soil erosion. Microorganisms living in the upper layers of the soil, essential for rejuvenating soil fertility, are lost. Crop production declines to nil.

Rangeland carrying capacity is exceeded by increasing herd size and/or loss of rangeland to farmers. As herds increase, often in response to increased availability of water provided by misguided development projects, they strip the land of vegetation causing a cycle similar to that described above. If farming expands during a wet cycle, as occurred in the 1960's, it cuts into traditional grazing lands and the same process can occur without increases in herd size.

In arid and semi-arid lands, the forest's carrying capacity is extremely fragile. Most trees are cut due to expansion of farmlands. Grazing and wood cutting take their toll, but represent a small fraction compared to the insatiable demand for new farm fields. Unfortunately, trees are the principle means for lands to maintain their fertility when using low capital technology. As described above, the carrying capacity of forests is often exceeded well in advance of that of crops or livestock. When this occurs, the carrying capacity of the latter two is more rapidly exceeded as dung and crop residues needed for fertilizing fields are diverted into fuelwood and tree leaves, dry season fodder for animals, are lost.

Our farmer is suffering from an excess carrying capacity in all three component systems. In order to produce enough grain to see her family through to the next harvest she has reduced the fallow cycle of her bush fields, reduced yields followed. While she always used her best field permanently, now she has to use the animal dung that once fertilized the field for fuel because she can't afford to spend the extra time needed to gather enough fuelwood. The declining yields from this field is her greatest concern. With the growth of her village and the the addition of a new village nearby, her children complain that they have been crowded out by older children and they must push the herds further and they find less fodder. She has little help with these problems; everyone has the samé complaints. She could move, but that would mean leaving the home of her grandparents and her relatives, her only social security. She stays and hopes. If another drought comes she knows she may not survive, but what alternative is there?

Agroforestry: The Art and Science

The art of agroforestry has been practiced for hundreds of years, probably since a hunter's wife scattered a few of the previous season's wild grain on a plot of good land. In the last decade or two, modern scientific technique has been applied to record existing agroforestry practices and research new combinations of trees, crops and animals that hold promise of synergistic benefits.

The practice of agroforestry by development agencies is new. The word itself did not come into use until the late 1970s. CARE began its first agroforestry project in the Sahel in 1974, at the urging of a farsighted Peace Corps Volunteer and his remarkable national forest service counterpart. Over the last decade, as project after project has shown promise, the term and the practice have become widely accepted by development agencies, host-country governments, and local people throughout the world. In Africa, where high-capital agriculture has largely failed to meet the needs of the people, agroforestry holds the greatest promise for resolving gaps in the basic needs of the rural poor. There is a nearly limitless set of agroforestry practices. Here we will list only a few to demonstrate how trees can be used in the smallholder farming system.

The choice of an agroforestry system ultimately depends on the desires of a farmer. The farmer must identify the key problems she has in meeting her basic needs, be it shortage of fuelwood, declining crop yields, lack of building materials, insufficient cash to purchase needed items, lack of fodder for animals, etc. With the help of an extension agents or a trained farmer-leader, she can learn the properties of the various trees that will grow in her vicinity and then identify the products she desires from trees.

To provide a structure for working out the choice of tree species and the spatial and temporal configuration of trees and crops she may use, CARE has adopted an Agroforestry Diagnosis and Design methodology developed by the International Council for Research in Agroforestry based in Nairobi, Kenya. This helps our project staff lead farmer groups through a process of consciousness-raising about tree planting, problem identification, and farm planning.

Once a village has gone through this stage, CARE will provide village, school, or community groups with technical assistance, materials and equipment to start a small tree nursery to produce the desired seedlings. Typically, a group nursery produces 2,000-10,000 seedlings per year to be distributed among the group members in exchange for their labor in the nursery. Private nurseries produce a smaller number of trees, many of which will be sold.

The planting of trees takes place shortly after the rains begin. Farmers visit the nearest nursery, selecting 10 to 100 or more seedlings of their preferred species to plant on and around their fields and home compounds.

CARE emphasizes on-farm planting for several reasons. First among these is tree tenure. If a farmer plants a tree on her own land, then she feels more certain that she will receive the benefits of that tree. Ownership results in a greater sense of responsibility for tending the tree and the chances of a tree surviving are enhanced.

A second reason for on-farm planting is the synergistic effect between trees, soil fertility, and crop production. Many of the trees that CARE introduces to farmers have the ability to fix atmospheric nitrogen in the soil through a symbiotic relationship with bacteria. For example, in Tanzania a four-year old stand of Leucaena leucocephala was shown to fix an average of 99 pounds per acre per year of nitrogen. In Senegal, an open stand of Acacia albida was found to fix 19 pounds per acre per year. Trees also are more deeply rooted than annual crops and can pull up deep nutrients and minerals depositing them through leaf drop on the soil surface for annual crop use. Trees also provide a permanent soil cover that helps prevent loss of fertile topsoils in the dry season and early in the rainy season when most fields are bare.

In arid and semi-arid Africa, almost all of the trees CARE helps farmers plant are hardwoods. Species are selected for a variety of properties. In addition to the nitrogen-fixing ability mentioned above, other useful farm forestry practices include windbreaks (neem, Grevillea robusta), live fences

(Acacia spp., mesquite), and intercropping (A. albida, Sesbania sesban).

A tree growth characteristic popular among farmers is the ability to sprout from cut stumps. Known as coppicing, this allows a tree to be harvested several times without replanting (neem, Eucalyptus spp.). Other properties that are sought out by farmers include: leaves that are nutritious animal forage (Acacia albida, Leucaena leucocephala, A. senegal); edible fruits and leaves (cashew, tamarind, baobab, Ziziphus jujube); and fruit, leaves, or bark that can be used for traditional remedies (Sesbania grandiflora). Species are also selected for a variety of wood products such as termite-resistant poles for construction (Eucalyptus spp., Borassus aethiopum); slow-burning and smokeless fuelwood (Acacia spp.); and easy-to-work and attractive wood for furniture (Balanities aegyptiaca). Valuable secondary products such as gum arabic (A. senegal, A. seyal) or tannin (A. nilotica) are appreciated by farmers.

Trees are planted in a number of different ways on farm fields. Most common among these are windbreaks, property boundary lines, alley cropping, contour rows, intercropping and forest fallow. A short description of each follows:

Windbreaks: A windbreak is typically constructed of two or more rows of trees planted perpendicular to the direction of the prevailing wind. The purpose is to break the laminar flow of wind across a field, thus reducing its capacity to lift and carry soil particles. The effectiveness of a windbreak extends out to 10 to 15 times the height of a tree. Thus, the relatively short trees grown in arid and semi-arid Africa are commonly planted about 300 feet apart.

Property Boundary Lines: Often the first agroforestry practice adopted by farmers is planting the boundaries of fields. The principle motivation is to increase land tenure security. It does offer other advantages such as protection from wind and soil maintenance, while taking very little space out of crop production. Because it is a low risk agroforestry practice, CARE often starts with boundary plantings before moving on to more aggressive agroforestry practices.

Alley Cropping: Alley cropping consists of planting relatively dense rows of trees in bands across a field. Coppicing trees are preferred so that they can be cut short to reduce shading of crops planted between the alleys. The wood from the cuttings can be used in the home; while the leaves are either fed to animals or incorporated in the soil between the alleys. After a few years, when the annually cultivated soil begins to tire, the alleys can be rooted up and farmed while the exhausted soil is replanted with a new tree alley.

Contour Rows: Contour rows are similar to alleys but practiced on a hillside. These rows are not as wide as the alleys and they must carefully follow the horizontal contour. As in alley cropping, rows are kept short to avoid shading. Trees planted in this manner immediately begin to accumulate soil behind the rows. Over time, this will result in a naturally formed terrace. Contour rows are not regularly rotated and the terrace can be permanently farmed.

Intercropping: Intercropping is the practice of planting trees at a wide spacing (20 to 50 feet) in a farm field. The trees planted are selected for light shade and nitrogen-fixing abilities. They offer protection from soil erosion and soil fertility maintenance as well as other uses. The most well-known intercropping species in Africa is the Acacia albida tree. It has the unique property of shedding its leaves during the rainy season when crops are grown and regrowing them during the dry season to provide welcome shade for animals. Not only does this species fix nitrogen, but the leaves and seed pods are a favored forage for animals.

Forest Fallow: Forest fallow and the closely related practice of bush fallow are the most common indigenous agroforestry practices. They are the principle means of regenerating soil fertility in shifting cultivation. Simply put, trees (or shrubs) are allowed to grow on fields between brief periods of cultivation.

A classic example of forest fallow in semi-arid Africa is gum belt farming in the Sudan, in which farmers spread seed of Acacia senegal across their fallow fields. Within five to eight years, the trees begin to exude a sap that is collected and refined into the valuable gum arabic. Sale of gum arabic may account for half of a farmer's yearly income. After 15 to 25, years the production of gum falls off and the trees are cut and sold as fuelwood or charcoal. The fields are then ready to farm again for three to five years.

Because of population pressures, few farmers today enjoy the luxury of enough land to fallow for so many years. What CARE can help with, then, is to hasten soil rejuvenation during fallow periods. This is done by planting seedlings instead of seed. We can also help by introducing species that provide advantages over the natural fallow such as nitrogen-fixing or valuable products.

The ability of trees to enhance farm production is now clear. However, due to many reasons, the widespread adoption of agroforestry in Africa has yet to occur. One reason is simply the youthfulness of its scientific practice and, compared to other rural development sectors, a relatively undeveloped body of knowledge. Another is the lack of extension institutions to spread existing knowledge. Also, the rational conservatism of subsistence farmers in adopting new practices hampers the spread of agroforestry techniques. Finally, there is a lack of successful models of agroforestry projects to draw upon. The next section will provide two such examples drawn from CARE's agroforestry program in Africa.

Agroforestry: The Practice

The two case studies presented below were selected for their different approaches to similar problems. It is important that the practice of agroforestry not repeat one of the worst mistakes of the green revolution: introducing a rigid technical package. Agroforestry practices, by their nature, will be highly variable. This is as it should be. Soils, climate, and culture are all too variable to try to squeeze them into a small number of technical interventions.

CARE's agroforestry projects in Niger and Kenya have, in different ways, won the acceptance of the local farmers. This is far more important than a simple quantification of success such as numbers of tree planted or acres treated.

Niger-Majjia Valley Windbreak Project*

In mid-February, the winds of the Sahara are still blowing strong in Niger. In the capitol, Niamey, the air is full of brown dust, but further east, hard-driving winds blow gritty sand through the Majjia Valley. Quite literally, the desert seems to be on the move, engulfing the countryside. The true desert is 200 miles further north, but the sparse vegetation and omnipresent sand suggest a closer presence.

The Majjia Valley is located in south central Niger, over 300 miles east of Niamey. An ancient sea bed, the Majjia is a fertile agricultural valley. From the plateau north of the valley, the surroundings look bleak and desolate, with few trees in evidence. The descent into the valley is steep and rocky, passable only to four-wheel drive vehicles and foot traffic. There is no permanent river flowing through the valley; the floodplain has water only after the rains. Yet the valley is not as difficult as it initially appears. An estimated 33,000 _ people live in the Majjia, comprising twenty-seven villages. The area's farmers make their living from growing millet, sorghum, and a little cotton, and raising livestock, such as goats, sheep, and cattle.

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* Adopted from Paula J. Williams, Institute of Current World Affairs

The strong winds that blow through the valley threaten the villager's livelihood. During the long dry season, from November to May, little vegetation covers the ground. The desert winds blow almost incessantly, carrying away valuable topsoil. During the the rainy agricultural months, the winds continue to blow but from the opposite direction, drying out young sorghum and millet plants.

For the past eleven years, CARE has promoted tree planting in windbreaks in the valley. The project was designed to conserve soil, protect agricultural production, and to produce wood for use as fuel and poles.

The windbreaks consist of double rows of trees, planted 13 feet apart, with 330 feet between the double rows. Many of the windbreak lines are a mile in length. Since project inception, nearly 250 miles of windbreaks have been planted, protecting some 9,800 acres of cropland. The size of the project is difficult to imagine in the abstract. Seeing the rows of trees stretching from horizon to horizon is more impressive. What is particularly remarkable, is the number of people that have been involved in planting the trees.

The project was initiated in 1974 when a Nigerien forester and a Peace Corps Volunteer approached CARE for financing. The forester had been the county's forestry extension agent for several years. Having excellent rapport with the villagers, he had already persuaded many villagers to plant woodlots and individual trees. The valley's farmers were themselves interested in planting the windbreaks, as they were concerned about the wind erosion in the valley. They had great confidence in the forester, particularly after experiencing success with the woodlots.

The project began with CARE providing the financing and the farmers their labor and land. The Nigerien Forest Service and the Peace Corps provided technical assistance and field supervision. CARE established three small nurseries to produce tree seedlings. This involved digging wells, purchasing metal fencing, seeds, fertilizer, and other supplies, as well as paying the salaries of nursery workers. CARE also provided transport for the seedlings and paid guardians to protect the trees--for the first three years after planting--from livestock grazing.

The majority of the tree planting has been done by voluntary labor provided by young men's groups called Samaria. The work involves two phases: the holes for the trees are dug late in the dry season, and the trees are planted after the first major rain. The work parties have the air of a festival. Often a local griot, or hereditary musician, will beat his drum to encourage the workers.

Although the villagers wanted to establish the windbreaks, many were initially reluctant to give up some of their own land for the windbreak lines. To be effective, the project needed coordination among adjacent landowners. The project plan was fairly arbitrary: trees were planted in straight lines, perpendicular to the wind, for a minimum distance of 660 feet. Consequently, it was not possible to wiggle the windbreak lines around reluctant farmers.

The fact that the project has worked is testimony to the charisma and hard work of the forester and his colleagues. As the project has progressed, the villagers have come to believe that the initial layout of the lines was wise. Furthermore, they are convinced that the windbreaks are improving their agricultural productivity. Nearby villages have asked CARE to help them start their own tree planting programs. We have responded by starting in five new sites.

Development workers have also grown increasingly interested in the project, both to understand the project's impact and to assess the possibilities for replication elsewhere. A small study undertaken by a Dutch graduate student in 1980 suggested that the windbreaks had increased crop production by an average of 23 percent. In 1984, a major evaluation study, financed by CARE, USAID, and USDA, was begun to expand on these initial results. It is scheduled to be completed by the spring of 1986.

CARE attributes the project's success to a number of factors. First, the local forester had excellent rapport with the farmers. Second, he had the backing of the local authorities. Third, the project responded to a problem that the villagers had identified themselves. Fourth, the area was a fertile site, where the agricultural productivity was worth protecting and the trees planted grew well. Finally, the project began on a small scale. Only after encouraging results had been obtained was the project expanded.

Although overall prospects for combatting desertification in the Sahel seem bleak, the Majjia Valley project holds hope. For many Sahelian farmers, for whom daily existence can be precarious, the windbreaks offer proof that people can mitigate their situation--that they are not helpless when confronted with desertification.

Kenya-Agroforestry Extension Project

The Siaya district of Kenya's Nyanza Province provides a sharp contrast to the Sahelian plains of Niger. Here a multitude of small farmers are tucked away in the rolling hills of the northwestern shore of Lake Victoria. Rainfall is ample, annually over 60 inches spread between the long and short rains. The red soil is fertile, although high in clay. But, when the torrential summer rains begin, the brooks and rivers of Siaya run red with topsoil carried from farm fields. Though rains are plentiful, most of it falls in a few wet months. With the loss of the topsoil, the rainwater is lost as runoff. Thus, Siaya is also well on its way to desertification.

The Luo tribe that lives in Siaya is one of the fastest growing groups in Kenya, which itself has the fastest rate of population expansion in the world. Holdings have been increasingly fragmented and farmers are forced to work ever steeper slopes, resulting in a spiral of increasing soil erosion and declining crop production. As the hillsides are cleared for farmland, the availability of fuelwood declines. Market prices for firewood and charcoal rises, cutting into the income of many villagers who have to purchase their cooking fuel.

Within this context the Government of Kenya has recognized the need to begin immediately to address the problems of Kenya's worsening fuelwood shortage. They further identified Nyanza Province as an area extremely short of fuelwood.

CARE chose agroforestry as the most appropriate strategy for increasing fuelwood stocks in this area. Due to intense population pressures on these lands, it is not feasible to substitute crops with forests. Agroforestry offers the ability, in this potentially productive zone, to meet both fuelwood and crop production needs.

Begun in 1983, the project was designed to increase on-farm fuelwood production, while meeting other household needs (i.e., food fodder, fencing, crop production, poles timber shade, and cash).

The project has created a small group of dedicated extension agents to work with established community groups. Together they set up small community-managed tree nurseries. Our agents build upon existing farmer interest in agroforestry, local ideas, knowledge, and organizational skills. The role of the extension agents is to facilitate an exchange among community members and outside agencies such as the Forests Department, through which material and technical assistance can be shared. Second, through CARE, they provide a minimal amount of key materials and equipment without which the community groups would not be able to participate. Finally, they foster the formation and/or strengthening of community groups into long-term viable organizations.

Often the project works with the popular women's clubs. A number of school groups have been organized as well. After introducing themselves, the agents hold informal discussions with the group members to identify their most serious concerns. If problems that can be addressed by agroforestry come up, and they invariably do, the extension agents will offer the project's assistance to the group. Problems that cannot be addressed by the project are referred to other projects or agencies.

Group discussions focus on topics of agriculture and fuel-wood. If the group is sincerely interested in agroforestry, they are asked if they would like to start their own nursery. A participating group is provided with seedling bags, a few simple tools, and seed of their preferred tree species. The group must provide the land for the nursery, an adequate water supply, and all labor to operate the nursery. When the seedlings are ready for transplanting, the group decides how to share the seedlings based on the level of an individual's participation in the nursery's operation. Agroforestry configurations used include: alley cropping, contour rows, boundary plantings, and intercropping.

The initial three-year project proposal called for the creation of 36 community nurseries and to produce 1.6 million seedlings. By the end of the second year's planting season, the project had created 79 nurseries and planted 200,000 seedlings more than expected. The project is now expanding into South Nyanza district, a move that had not been planned until the second project phase.

The Kenya project was spotlighted on an British television program as an alternative to large externally funded efforts. The television crew's interview with one of the project's extension agents poignantly illustrated the participatory focus of the project. Though awkward in front of the camera, he spoke eloquently of the trust the farmers must have for an extension agent before they will undertake a new activity. He pointed out that the project belonged to the people, and he was simply a facilitator.

Because it adopted the lessons learned in the Majjia Valley about community forestry, CARE believes the Kenya project will prove to be as successful in its own right. In Kenya, we select our extension agents from the local communities so they will have the trust of the villagers. Second, we work closely with national and local government officials in the design and implementation of the project. Third, we allow the villagers to use their own organizations to identify local problems and seek their own solutions. Fourth, the project's interventions are simple yet effective in addressing fuelwood and soil fertility depletion. Finally, the product of the nurseries and plantations belong exclusively to the project participants.

We do not pretend that the Kenya Agroforestry Extension Project is the solution to all the problems confronting the farmers in Siaya. There are large hurdles to overcome, such as reducing the population growth rate, that if not addressed will threaten the long-term viability of any development project. But we feel we have made a start. It is likely that the strengthening of community groups and the resolution of one of their most critical problems will have an indirect benefit by facilitating the work of CARE and others in community-managed projects and allow the farmers to focus their efforts on addressing other problems.

Mr. **Valentine**. Thank you very much.

Let me ask Dr. Kamusikiri this question. You talked about, Doctor, the understanding of the African culture and the knowledge of African folk of their land and what it will do or won't do and reliance on their knowledge and ability. Are you saying that the introduction of this type of fish farming would work or would not work in your opinion?

Dr. **Kamusikiri**. Mr. Chairman, what I'm saying is that the introduction of this fish farming would work, one, because it is an integrated fish farming which incorporates the African tradition of mixing, you know, their cows with the trees and the grass and mixing their crops. We have the fish and we're going to also—I would actually, in effect, ask because we're working with Auburn University and we have a representative here, I don't want to explain that to him because he is the one that is our expert on the fishing. But one reason we chose Auburn University is they have this integrated approach which we feel carries the African basis for food production. Would you mind, Mr. Chairman, if I could get up, by your permission, and give the courtesy to him to talk a minute.

Mr. **Valentine**. Certainly.

Yes, have a seat, sir. Would you identify yourself for the record.

Mr. **Moss**. My name is Don Moss. I'm the associate director for International Center for Aquaculture, Auburn University. I have 35 years' experience in fisheries and aquaculture, last 20 of which has been as associate director of our ICA, we call it, International Center for Aquaculture.

And, Mr. Chairman, I can vouch that catfish are good to eat. I'm ready for one most any time. But these tilapia that you've been hearing about are equally as good. They are extremely tasty fish and we have envisioned a plan which these fish are from Africa, they're well accepted by most Africans already; and if we're clever to integrate agriculture, small gardens along with the fish culture, small livestock, forestry plots, there's no way that this can lose. We've seen it, tried it in other countries; we ourselves have tried it in a Latin American community in an area where the campesinos are extremely poor, very little resources and the amazing thing about this is that one component builds upon the next, you see. So that really the sum of the total is greater than the sum of the individual parts.

If you were to ask me if fish culture in Africa would work on its own as a separate component, I would hesitate to answer until I knew the particular country and the resources that country had, whether it could be done in a semi-intensive basis or not.

But what we're talking about here is a less inputs type, rather extensive type aquaculture in which you involve these other components of agriculture in a way that each adds to the other and then, of course, the sum total of that makes a very interesting program for people, whether they are in Latin America or Asia or Africa.

Mr. **Valentine**. Thank you very much. Thank you very much.

Dr. Irwin-Williams, you have—have you actually done experimentation or do you—I guess the better word would be pilot project. Have you actually done this in Nevada?

Dr. IRWIN-WILLIAMS. Yes; we have. And, indeed, I can describe a personal experience with doing some of this about a month and a half ago. We cleared gravel from the surface of the desert in an area of central Nevada which has about a hundred millimeters of rainfall a year, about 4 inches of rain a year, just simply cleared a slope of the gravel which essentially slows the water flow downhill and allows the water to seep into the ground. Without that gravel present, the water will run off and can be captured. We wanted to find out at what rate this could be done and whether, in fact, the technique would work in that area of Nevada.

Two women, one of them myself, cleared a small, a very small pilot area of about 10 by 10 meters in an afternoon by using garden hoes, so that's the extensiveness of the equipment involved. And we simply planted a collection barrel at the bottom of the slope in the modified area and in an unmodified area for control, and we put in a rain guage to see what would happen the next time it rained, which it doesn't very often in Nevada.

The next time it rained, we had a one-tenth of an inch shower which produced on the unmodified area no water whatever. There was no runoff whatever. In the modified area, which is a small zone, as I say, 10 by 10 meters, in the collection barrel was 25 gallons of water. This gives you an idea of the kind of output for that kind of minimum input.

So, yes, we have done those kinds of experiments. We've done them on large scales, also. We have in place right now a much larger water harvesting project outside of Reno, NV, which is designed for a slightly different purpose. It's designed to recharge the subsurface aquifer from which one of the suburbs of Reno receives its deep well water. And we're simply harvesting water from one of the nearby mountains to improve the recharge capacity of that. It's working very well. So, yes, I have participated in this. And we have experimental data that we'd be happy to discuss in detail.

Mr. VALENTINE. One more question. Do you envision, say, a village—I have never visited the continent of Africa, but do you, lady and gentlemen, envision, say, a village of 300 people in some remote part of Africa with a excavation area the size of this room or smaller than that to catch the rainwater and that they would take care of it with what resources were available? Is that what we're talking about really?

Dr. IRWIN-WILLIAMS. Yes; we're talking about villages of perhaps 100 to 500 people, possibly up to 1,000 people. In the southwestern United States some of the ancient cultures of the Chacoans, particularly, maintained a very high level of civilization, perhaps the most advanced, most sophisticated of our native American cultures entirely on the basis of rainwater harvesting; and for anyone who has visited the Southwest, these are some of the more impressive semi-urban kinds of settlements that we have there. They were based entirely on rainwater harvesting.

Mr. VALENTINE. For my colleagues on this subcommittee and full committee, I want to express our appreciation for what you have done and will do. It's a very important task. You have made excellent presentations. I think this has been one of the most informative committee hearings in almost 3 years.

I thank you very much.

Also I have misplaced the card for the gentleman from Auburn who brought me these brochures about catfish farming. You know, people laugh at catfish, but I have a constituent outside of my village in eastern North Carolina who raises the catfish. Now he's gone into these little things they eat in New Orleans what we used to throw away in fishing—crayfish. And he feeds the catfish like you'd feed chickens.

Well, what reason my attention was drawn to the gentleman from Auburn was because I want to compliment him on being like a politician. A very fine statement for you to make without knowing in advance you were going to be called on.

Mr. Moss. I also have another card, Mr. Chairman.

Mr. VALENTINE. Please let me have it. Thank you for your participation.

And the subcommittee stands adjourned.

[Whereupon, at 1:45 p.m., the subcommittee was adjourned.]

AFRICA AND HUNGER: PROSPECTS FOR SUSTAINABLE DEVELOPMENT IN SUB-SAHARAN AFRICA

WEDNESDAY, OCTOBER 30, 1985

House of Representatives, Committee on Science and
Technology, Subcommittee on Natural Resources,
Agriculture Research and Environment,
Washington, DC.

The subcommittee met, pursuant to recess, at 9:39 a.m., in room 2318, Rayburn House Office Building, Hon. James Scheuer (chairman of the subcommittee) presiding.

Mr. **Scheuer.** The Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

Today the subcommittee is holding the fourth in a series of hearings on the complicated and the agonizingly frustrating subject of drought and famine in sub-Saharan Africa, and also the prospects for long-term sustainable development there, and what are the different elements that go into the mix of producing equilibrium between food and people, enhancing food production, and moderating the population growth that, of all continents on Earth, is plaguing Africa by far the worst.

In last week's hearing, the subcommittee heard testimony on a number of innovative, low-technology approaches to increasing food production and reversing the desertification and deforestation that prevail across the length and breadth of sub-Saharan Africa.

The witnesses universally stressed the need for tailoring development objectives to local conditions, and they emphasized the absolutely essential importance of local support, local involvement in every aspect of the design, planning, and implementation of these projects.

Today the subcommittee will continue its examination of specific appropriate technologies and agricultural practices. In addition to that, we will hear testimony on the importance of actually reaching African women with training, with extension efforts, involving them in significant roles in development, and we will examine the role of international agricultural research as well.

Before calling on the witnesses, I would like to turn to my distinguished colleague, Congresswoman Claudine Schneider of Rhode Island.

Miss **Schneider.** Thank you, Mr. Chairman, and I would like to commend you for agreeing to hold these hearings this morning and enabling us to have additional information whereby we can have the subcommittee provided with some insight and additional helpful foresight as we examine some of the possible solutions in the ongoing problems of hunger in Africa.

I think that the wide range of experience that we will be hearing from today will help our committee fashion the most effective, and hopefully the most appropriate, agenda for research and development in order to help us solve these international environmental problems.

At previous hearings, we have had the opportunity to examine the role of appropriate technologies in helping to increase Africa's long-range food production. In order to meet these challenges, these international programs really need to emphasize the environmental and sound agricultural development practices which will increase food productivity and, at the same time, restore the continent of Africa's fragile natural resource base.

We are going to be looking into more effective ways that we can be doing this through direct Government assistance, but I am also delighted that we will be hearing from the private sector, and we will be learning how we can bolster the private sector organizations within specific African countries.

The message has been put forth, I think, very clearly by Dr. Gus Speth, who is the chairman of a very important task force of the Energy Environment Study Institute, on which I have had the privilege to serve as a participant. Dr. Speth has pointed out that certainly the need to develop effective strategies for improving the status of women and of all people in African society is extremely critical, and it is clear that women have played an integral part in the African economy and in social development.

As a matter of fact, during my recent trip to Nairobi, under the auspices of the U.N. Environment Program, in order to attend the U.N.'s Decade on Women Conference, I had the opportunity to hear time and time again from women about the need to provide some clear objectives for women's training programs within the context of overall food production programs.

I think we should also turn to the recent recommendations of the Office of Technology Assessment in their recent report on "Africa Tomorrow: The Issues in Technology, Agriculture, and U.S. Foreign Aid." It emphasized that women do contribute a significant amount to the production of food crops in Africa, but unfortunately, they had limited access to extension services, credit, and training programs.

I might add that that situation is not too dissimilar from the situation we have here in the United States, but certainly we are making substantial strides, and I think it is useful that we attempt to frame our programs in such a way that they can specifically assist women.

I think the consequences of our failure to examine and enlist the full potential of women in the workforce, particularly in tasks of African development, certainly could be serious, if not fatal, when we recognize that somewhere between 60 and 80 percent of all agriculture that is raised throughout the world is essentially produced by women. It is also tragic to recognize that less than 1 percent of all agricultural land happens to be owned by women.

So, needless to say, there are serious inequities there, and I certainly would hope that our own U.S. Government policy would not overwhelmingly contribute to those inequities.

The U.N. Economic Commission for Africa strongly noted in the past that the possible effects of allowing the present situation in Africa to be perpetrated could be disastrous, and I think that this commission clearly stated that economic production would be depressed, and many important opportunities of African development would be missed, if we fail to provide adequate extension services and training for African women who carry out so very much of the work.

And so, Mr. Chairman, without any further comments, I would like to thank you for enabling me to have the time to make these remarks, and also, I look forward to a most productive hearing, and thank you for your willingness to hold these.

Mr. **Scheuer**. Thank you very, very much, Congresswoman Schneider.

All right, we will go right to the witnesses. For the first witness, we will hear from Dr. Nyle C. Brady, Senior Assistant Administrator, Bureau for Science and Technology of the Agency for International Development.

We are delighted to have you here with us today, Dr. Brady. We are operating under a tight timetable, and because we wish to have a chance to ask you all questions, we are going to ask you to stick pretty much to the 5-minute rule.

So if you would resist the impulse to read your testimony and simply chat with us informally for 5 or 6 minutes, hitting the high spots, then we will have a chance to ask you some questions.

STATEMENT OF DR. NYLE C. BRADY, SENIOR ASSISTANT ADMINISTRATOR, BUREAU FOR SCIENCE AND TECHNOLOGY, AGENCY FOR INTERNATIONAL DEVELOPMENT

Dr. **Brady**. Thank you very much, Mr. Chairman. I appreciate very much this privilege of meeting you.

I think we are all aware of the fact that Africa is in trouble. Food production growth since 1960 has averaged less than 2 percent a year. In the region south of the Sahara, per capita food——

Mr. **Scheuer**. Has it ever gone much over 1 or 1.1 percent a year? Has it ever approached——

Dr. **Brady**. It depends on the countries. I am taking them all as a group. It has been less than 2 percent, and their population growth has been above that, of course, and so their per capita food production has gone down.

Mr. **Scheuer**. Yes.

Dr. **Brady**. Now, one looks for reasons for this. We identify in Asia and Latin America reasonable success stories. I say "reasonable success" because they have only barely been able to stay up with their population growth, beating it a bit. But when we try to identify the reasons, among them is the fact that Africa has less water. It is basically a dry climate compared to Latin America and Asia.

Second, the training, the background of the scientists, of the educators is immeasurably lower in Africa than it is in the other continents. The institutions to carry out research work are generally poorly organized and almost entirely underfunded.

Third, there is not the availability of the improved technologies that came out of the system that started 30 years ago in Asia, that we helped start. The International Agricultural Research Centers were started in Latin America and Asia, and they had a 10- to 15-year start on any that were initiated in Africa. So the progress has been slow.

But, Mr. Chairman, I would argue that the same principles that were followed in Asia must be followed in Africa if we are going to provide them the technologies that will pay off. In some cases, we have made the same mistake that was made in Asia in 1950's and 1960's. We have assumed that all we had to do was to take some technology developed elsewhere, give it to the Africans, and say, "Thou shalt develop," and it didn't work.

Even where we took varieties from similar ecological zones in Asia, where it looked like they ought to work, they simply did not work because there were different insects and diseases in Africa than there were in India, for example, and so we have been forced to move toward——

Mr. SCHEUER. I am having trouble hearing you, Dr. Brady.

Dr. BRADY. All right. Is that better?

Mr. SCHEUER. Yes. Just pull it over and speak right into it. Would you repeat that last sentence or two?

Dr. BRADY. I simply said that what we are having to do is to do in Africa is just what we did in Asia. I had the privilege of working in Asia in the 1950's, and we had the concept that all we had to do was to provide the Asians the same kind of technology, take our hybrid corns over there, send over some American farmers and show them how to do it; take the rices that were growing well in California and stay there 4 or 5 years and the job would be finished.

Well, we discovered that that was not appropriate. We wasted quite a bit of our money, as a matter of fact, on the assumption that it was appropriate. Then we had to develop technologies that fit the Asian scene. We developed rices, we developed wheats, we developed maizes, we developed technologies to make use of those new varieties, and it has paid off. Literally billions of dollars of extra food is being produced as a result of these efforts.

We think the same kinds of principles ought to be used in Africa and are beginning to be used. And already, coming out of the international system, International Agriculture Research Centers, as well as U.S. universities and their counterparts in these countries, we are beginning to see the kinds of things that came out of the system in Asia.

Even though the numbers are not very great yet, there are improved varieties of cowpeas, one sorghum, hybrid sorghum, that is world famous for its resistance to drought, only one variety, and we have got to have dozens of them before this works. But those kinds of developments are coming out of these systems—a cowpea variety that will produce in 60 days and is reasonably resistant to insects and diseases.

The biggest problem we have relates perhaps to animals. Some people don't realize that there is an area of Africa south of the

Sahara equal to the size of the United States in which cattle cannot be produced because of the trypanosomiasis, the disease that causes sleeping sickness in humans.

Well, it is important to them from the standpoint of food, but it is also important to them from the standpoint of what land they can till. That means that the only power that they have, in most cases, to operate their lands is with the hoe, with the human being.

Incidentally, Miss Schneider, it is very frequently the female. The man has gone off to the mines or someplace to try to make some money, and it is the female and the children who are having to go with the hoe to try to till the land.

Also, the so-called slash and burn system that—I have a little diagram here that might illustrate what I am talking about. This is a reasonably stable system that the Africans for centuries have followed, and that is they burn the wood, woody species, grasses and so forth, and they start tilling the land for 2 or 3 years, and then they allow it to go fallow. The green [on the diagram] shows the fallow.

The fertility level has been reasonably well maintained with this kind of system. It was quite stable. And so, even though we in the western world think that is very foolish, if we didn't have any animals or power to till your land, we would probably do the same thing.

Well, as a result of increases in population, that system has moved into one that looks like this [diagram]. You still have your slash and burn. You still have your fallow period, but instead of the fallow period being 10 to 15 years, giving the soil time to be regenerated as a result of nutrients that would be pulled up by the trees and bushes that were growing there, that period of time is 3 to 5 years, and the fertility level, then, is going down, as it is indicated here [on the diagram].

Here again, I think we can say without any doubt that some progress is being made, and that is through what we call a system of alley cropping. This is a system by means of which you plant your food crops, but on each side of the alley, you put a woody species. You take from that woody species the limbs, the leaves, and you use those to keep cover on the land during periods when the food crop is not growing very well.

You keep down erosion, and for a period of about 5 years, we have found that this fertility level has remained fairly constant without any massive inputs of fertilizer—a little bit of fertilizer, because these woody species are usually legumes that fix nitrogen, and they have to have a little phosphorus for them to grow.

But with relatively modest amounts of fertilizer, we have been able to have production that would be double or triple what the farmer would have under these circumstances.

Also, I would point out that we are taking a look, not only at the centers in Africa but elsewhere, at the potential of biotechnology to help us develop varieties that would be resistant to insects and diseases, to develop varieties that would tolerate very acid soils.

If we have acid soils in this country, we lime them. We can afford this; Africans cannot. So we must try to find plants that will tolerate the acidity, and we have already begun to do this. The tissue culture and other biotechnology techniques will help us in this regard.

So I would say, Mr. Chairman, that the situation in Africa is bad, but I would say that it is not hopeless, and I would say that there is some evidence that the same kinds of things that we did in Europe or in Asia in the 1950's and 1960's, we are doing now in Africa.

We are putting about $95 million a year into agricultural research in Africa through these international centers, through universities, U.S. universities that are collaborating with their counterparts overseas, and directly to national research programs through our country efforts.

I have a number of publications here that might indicate to you a summary of the successes that we have had, and I will also leave a copy of this little alley cropping bulletin to show you that there is hope to move toward a system other than the slash and burn, which we know to be very destructive of soil fertility.

One last thing I would like to comment on, and that is the human resources. In Asia, we went in and, particularly in a country like India, we helped them develop about a dozen agriculture universities patterned very much after our land-grant universities in this country. And so, very soon, India did not have to send their people to Europe or the United States to get masters and Ph.D. degrees. They gave them those degrees right in their own country.

I would argue that much of India's success in agriculture has come from the fact that they have this quality series of universities. The Africa Bureau of U.S. AID has developed a basic game plan that says let's look ahead 15 years and see what we want to try to help Africa develop.

One of the things that we are doing is developing a plan to try to help these selected universities, not in 45 countries but in 6 or 8 locations, perhaps, help them develop over a period of time into quality institutions so they can train their own people and provide the expertise that is needed.

Thank you, Mr. Chairman. I will be glad to try to answer any questions that you may have.

[The prepared statement of Dr. Brady follows:]

Statement of
N. C. Brady
Senior Assistant Administrator
for Science and Technology
U. S. AGENCY FOR INTERNATIONAL DEVELOPMENT

Before the
U. S. HOUSE OF REPRESENTATIVES
Science and Technology Committee
Subcommittee on Natural Resources,
Agricultural Research and the Environment
October 30, 1985

Mr. Chairman, thank you for the opportunity to testify about agricultural technology in sub-Saharan Africa and related topics.

Africa is in trouble. Since 1960, growth in aggregate food production has averaged less than two per cent per annum. In the region south of the Sahara, per capita food production decreased some 20 percent from 1960 to 1983. Yields per unit of land for food commodities are the lowest of any region in the world. The widespread droughts of the past 2 years have intensified these food production problems, but are only the tip of the iceberg. The result of these food deficits has been growing dependence on food aid and increasing use of scarce foreign exchange for food imports rather than for other pressing development needs.

Because of the particularly difficult physical and harsh climatic conditions that prevail in much of Africa, the technologies which created the Green Revolution in Asia and parts of Latin America are not directly applicable to Africa's agricultural needs.

A close examination of African agriculture reveals that the causes of poor performance include restrictive economic policies; weak institutions; critical shortage of scientists, teachers, and agricultural managers; and few farmer-tested, high-yielding technologies.

Natural Resource Limitations

While Africa has some highly fertile and productive areas, vast portions of the continent present soil-management problems that have not yet been properly addressed. Geographic expansion of agricultural production has often led to deforestation and devegetation accompanied by soil erosion, depleted soil fertility and reduced water-holding capacity of fragile African soils.

In most of the countries south of the Sahara, lack of adequate water resources provides another serious constraint to agricultural production. Unlike most of Asia and much of South America, Africa is not blessed with the rainfall levels and dependability needed to assure sustained crop production. Furthermore, irrigated land is not extensive and the potential for increased irrigation is limited by high costs and lack of institutional and human capacities to manage irrigation systems.

Water deficiencies and lack of superior crop varieties have also limited responsiveness of food crops to applications of fertilizer. As a result, fertilizer nutrient use per hectare of arable land in Africa is a fraction of that for Asia and Latin America and has not increased significantly in the past 10 years.

Policy and Training Constraints

But not all of Africa's problems relate to natural resources. Unfavorable economic policies have certainly contributed to the present agricultural crisis. For example, in most countries there is little economic incentive for farmers to increase agricultural production. Likewise, various factors have prevented the building of strong agricultural institutions. In most countries of sub-Saharan Africa, the basic institutions required to step up agricultural production are weak in financial and human resources.

Strong institutions must have quality people. The lack and poor management of trained personnel, from farmers to senior administrators and scientists, are major factors in the present agricultural crisis. Furthermore, inadequate educational systems from elementary schools through colleges and universities constrain the ability of African countries to provide the trained person-power needed to sustain accelerated agricultural production.

Human and Animal Diseases

Perhaps more than any other continent, Africa's food production is constrained by debilitating human and domestic animal diseases. Human diseases of the tropics such as malaria, cholera, snail fever and sleeping sickness, along with diarrhea, are widespread and cause high infant mortality. Impoverished conditions limit the abiltity of governments and populations to improve health conditions.

Animal diseases also have a direct negative effect on food production. For example, in central Africa, in a land area as large as the United States, the dreaded Trypanosomiasis (sleeping sickness) prevents the production of livestock. As a consequence, in large areas meat and milk production are severely limited and the only power to till the land is human energy.

Slash-and-Burn Agricultural Systems

For decades, African peasants and counterparts in areas of Asia and Latin America have practiced a system of slash and burn, or shifting cultivation. An area was cleared, the vegetation was burned, and crops were planted and grown for 2 to 3 years. Then the area was left fallow for 10 to 20 years to allow natural vegetation to regenerate soil fertility. The farmer moved on to another site and the process was repeated. The system was reasonably stable, kept vegetative cover on the land most of the time, and required minimal outside inputs.

In recent years, the shifting cultivation system, which requires much land and few people, has begun to fail. Increased populations have forced drastic reductions in the length of fallow, permitting only partial regeneration of the soil fertility before the land is again cleared for cultivation. As a result, crop yields have declined and soil erosion has increased bringing about associated decreases in the vegetative cover.

Constraints on Africa's Green Revolution

The cereal-crop green revolution which has helped Asia and Latin America stimulate agricultural production has had all too little effect on African agriculture. There is a dearth of farmer-acceptable improved technologies for that continent. This is due to a number of factors the most important of which are the following:

1. Harsh soil, climatic and environmental conditions which drastically reduce the applicability to Africa of many improved technologies developed on other continents.
2. A dearth of productive national agricultural research institutions focused on food crops.
3. An equal lack of educated and trained scientists to carry out agricultural research and
4. A lack of coordinated and sustained agricultural research efforts over a period of time to produce improved, suitable technologies in Africa.

US Support for Agricultural Research

AID has taken positive steps to help the Africans create improved technologies suitable for their conditions. We are providing significant support for agricultural reseach in Africa. In FY 1984, A.I.D.'s Africa Bureau and Science and Technology Bureau together spent $95.1 million on agricultural research in Africa. Seventy-two percent of these funds supported cereals research, 13% supported research on animals, and the other 15% was applied to research in connection with other African dietary staples such as roots, tubers, legumes, and oilseeds. These research efforts are continuing and are beginning to pay off.

First, we support the international agricultural research centers (IARCs) sponsored by the Consultative Group on International Agricultural Research (CGIAR), five of which have permanent locations in Africa and 5 others with significant programs on that continent.

Second, we support what we call Collaborative Research Support Programs (CRSPs) involving 8 specific food and utilization elements of production. Forty U.S. institutions are working on 143 different research projects with 63 host institutions in 30 countries. The involved institutions also help to fund these worldwide collaborative efforts. Six of the CRSPs have significant activities in cooperation with African institutions.

Third, through our mission programs we are providing support primarily for institution building and training within the country. These mission efforts complement the specialized efforts of the international centers and universities and focus on the country-specific problems which must be faced.

Recent Accomplishments

Our initial efforts focus on three major areas -- the creation of improved crop cultivars, the removal of constraints to animal production (with primary emphasis on diseases and feed availability), and the improvement of soil and crop management systems. In each case specific progress has been made.

Research on wheat, rice and maize has yielded significant results of importance to Africa. For example, the highly successful corn programs in Kenya and Zimbabwe are evidence of the kind of progress that is now being made. Scientists in Zimbabwe, over a fifteen year period, have produced hybrids with high-yield potential. Small- and large-scale farmers in kenya and Zimbabwe have widely adopted the hybrid maizes and have greatly increased national production. This feat proves once again that, contrary to common belief, small-scale farmers are willing and able to quickly adopt proven new technologies if these technologies are truly superior..

The International Institute of Tropical Agriculture (IITA) in Nigeria and the Beans/Cowpeas CRSP are making significant progress in improving cowpeas. One result of this research is a new cowpea variety, tested in Senegal, that takes only 60 days to mature, is more drought resistant, and 2.5 to 5 times more productive than local varieties. Other new varieties are resistant to diseases and pests of this crop.

In the Sudan, a new sorghum variety has been introduced which tolerates the droughty conditions and yields 2 to 3 times what the old varieties produce. This breakthrough was the result of a truly collaborative effort between the International Center for Research in the Semi Arid Tropics (ICRISAT) and U.S. universities that have trained people to help develop this variety and have provided some of the genetic resources that were used in the research.

More prolific and hardier varieties of cassava, sweet potatoes, and other African food crops are also being introduced to African farmers and a newly identified strain of rhizobium is being tested in Africa and elsewhere for its ability to increase yields and produce extra nitrogen for subsequent crops.

It is evident that the same principals of crop improvement that fostered the green revolution in Asia and parts of Latin America are being used to help Africans improve their own crops. But we are just beginning. A single drought-tolerant sorghum for all of Africa is just a small step. But it is a step in the right direction.

Animal Research

In terms of animal diseases, A.I.D. is helping to support work on several fronts. Trypanosomiasis is proving to be a difficult disease to overcome. Scientists have not been able to develop a vaccine because the organism is very adaptable and quickly generates resistance to experimental vaccines. However, researchers at the International Livestock Center for Africa (ILCA) have uncovered a degree of tolerance among some of the native (Ndama) cattle. They are now attempting to isolate the cause of the tolerance so that it can be cross-bred into disease-susceptible native cattle. Since the disease-resistant animals are rather small, the research is focussing on building the tolerance into larger, more productive breeds.

Progress has also been made in controlling East Coast Fever of cattle. Using isolated strains of this disease organism, researchers at the International Laboratory for Research on Animal Disease (ILRAD) have successfully vaccinated cattle in Kenya. Trials are to be extended to other areas of Africa affected by this devastating disease.

The Small Ruminant CRSP has identified and eradicated a goat arthritis disease (Caprine Arthritis-Encephalitis (CAE)) which had entered Kenya with foreign breeds and was wiping out small flocks. In Morocco, this CRSP identified a prolific breed of sheep and is working to preserve this valuable resource. With proper management and disease control the improved animals are expected to more than triple the number of lambs produced by non-prolific breeds.

Farming Systems

In terms of farming-systems, researchers are testing viable alternatives to slash-and-burn agriculture. "Alley cropping," a method of interspercing rows of leguminous trees and food crops, sometimes augmented with a little phosphorus, is receiving much attention. Instead of the yield going down a year or two after the land is cleared -- as it does with slash-and-burn -- on experimental alley-cropped fields, the yields have stayed high for three or four years. In addition, the trees prevent soil erosion, and provide forage for small ruminants and enough residue for use as a nutritious green manure on the food crop. Three of the international centers are working on alley cropping and another is focussing on other agroforestry systems that combine the growth of trees and crops.

Alley cropping and other such agroforestry systems work under experiment station conditions. Demonstration of these successful systems on their own or neighbors' fields will encourage farmers to use these alternative systems, stay on the same land year after year and improve it with fertilizer.

Fertilizer Response

Soil fertility obviously plays a key role in determining crop production levels. As was the case in Asia, the availability and wise use of fertilizers in Africa is a requisite for increased food crop production. The International Fertilizer Development Center (IFDC) is conducting soil and crop management research on the response of African upland crops to fertilizers. The results of these experiments clearly establish that chemical nutrient deficiencies seriously constrain upland crop production. Food security for Africa will require several-fold increases in the use of fertilizer for rainfed crops.

Potential of Biotechnology

Traditional breeding methods have done much to move agriculture forward by modifying crops and animals so that they fare better in less-favored environments. However, more recent use of biotechnology adds potentially powerful, time-saving tools to the research arsenal. As agricultural research capacities develop in Africa, this new science will not replace traditional methods but will enhance the work of the newly strengthened research institutions.

Using plant cell and tissue culture techniques, researchers can stimulate the production of hundreds of experimental plants in a single laboratory container. The plants can then be selected for tolerance to factors that limit agricultural production. Currently, such research is underway in several countries to increase the salt tolerance of cereal crops. Some successes have been reported.

Biotechnology techniques can be used to identify the rhizobia bacteria genes which tolerate adverse soil conditions such as acidity or aluminum toxicity. Those genes can then be transferred into rhizobia strains known to have high nitrogen-fixing capacities for use by farmers who must cultivate adverse soils.

There is general agreement about the remarkable long-term potential of biotechnology to increase both plant and animal production. These relatively new techniques may require longer-range research commitments, but have a vast, untapped potential.

Future Plans for Agricultural Research

In order to use our financial and human resources most effectively, A.I.D.'s Africa Bureau and Bureau for Science and Technology have jointly developed a plan to more specifically focus future investments in agricultural technology for Africa. First, the Agency will concentrate the bulk of its resources on a relatively limited number of countries, commodities, and research programs which are most likely to produce new technology and contingent economic benefits.

Second, we will increase attention to the development of strong - commodity research programs while, at the same time, refining the role of farming systems research to ensure that on-station research programs respond to the real needs and concerns of African farmers. Greater attention will be given to such factors as risk, input availability, and scale of application, that can reduce small-scale farmers' access to new technologies.

Third, we will use the capacity of major U.S. agricultural institutions to carry out research on agricultural topics of particular concern to the African countries we are assisting.

And finally, to increase the resources available for these efforts and to enhance their use, we will continue to facilitate our collaboration with the World Bank and other donors and to develop long-term national agricultural research strategies and programs to which donor resources can be most effectively applied.

National food-crop research programs will be encouraged in the few countries which already have relatively strong human and financial resources, significant area planted in priority food crops, and other donor support. Each of these national systems will be encouraged to develop sound management plans and long-term research agendas. On-farm testing and feedback from farmers will be encouraged.

Collaborative zonal research networks will be formed to help maximize the effective use of research resources, reduce country-by-country duplication of effort, and improve testing and dissemination among scientists of research information. M.Sc. and Ph.D. participant training programs will take into account the scientific human resource needs of the selected country as well as the broader requirements of the zone.

Initially, A.I.D. plans to support four to six commodity networks, each in one or more zones. The commodities which appear to have highest potential are: maize in the eastern highlands, western coastal, Zaire basin, and southern zones; sorghum and millet in the southern, Sahelian, Sudanian, and eastern highlands zones; roots and tubers (cassava and potatoes) in the Zaire basin and western coastal zones; edible legumes (particularly beans and cowpeas) in the eastern highlands, western coastal, and Sahelian zones; and upland rice in the western coastal zone and Madagascar. Forages and trees are important in mixed farming situations, i.e., mixed food crop and livestock farming, alley cropping and agroforestry, and will receive attention in the Sahelian, Sudanian, eastern highlands, and southern zones. Soil and water management will receive special emphasis in all of these networks and on-farm testing will be encouraged to verify applied research results.

The strongest and most productive national research institutions will also be encouraged to help implement commodity networks with other national research systems and with regional and international research centers. These networks will facilitate the planning and coordination of the national research programs. Initially, the Agency will encourage and help the IARCs to vigorously participate in the development of the national research systems and to take a leadership role in the development of the zodal networks. As they gain strength, the national systems will assume network leadership roles.

Improving Faculties of Agriculture

Shortages of research staff trained at the college and post-graduate levels are a major problem for national agricultural research systems in Africa. This deficiency is due in part to the inadequacies of African universities. Not only are the agricultural faculties poorly trained, but they have little opportunity to do research and consequently are not science oriented. We hope to help change this situation.

With A.I.D. support, the IARCs are helping to remedy these human-resource shortages. Since 1962, over 7000 participants from sub-Saharan Africa have received research training from IARCs in the CGIAR system. Because the IARCs focus on applied research to improve major developing country crops, and carry out that research where it will be applied, participants receive training that is directly relevant to agricultural constraints in their countries.

While this kind of participant training continues to be useful, it cannot provide a solution to Africa's long-term agricultural personnel needs. The capacity and quality of Africa's agricultural institutions must be improved so that they can provide the necessary training and research experience.

We propose to accomplish these improvements by helping develop quality faculties of agriculture in four to six technology-producing countries. Our efforts will focus on building university agricultural education at the graduate degree levels through support to university research and teaching, and by enhancing university linkages to agricultural production.

The focus on faculties of agriculture will contribute to and benefit from the agricultural research. We will, therefore, attempt to strengthen at least one faculty of agriculture in each ecological zone so that zonal priorities can be addressed and the selected faculties of agriculture can become professional resources to serve research needs at both the national and regional levels.

Improved agricultural research systems and stronger faculties of agriculture, while not sufficient by themselves, are necessary for agricultural progress in Africa.

A.I.D. currently has the legislative authority to carry out these initiatives. However, the implementation of these plans clearly will require some restructuring of our assistance to African agricultural research. In order to create the least possible amount of disruption, we intend to make the necessary alterations gradually, through the ordinary course of program and project development. For ongoing activities, necessary changes will be implemented through the scopes of work of teams undertaking mid-term evaluations and developing second-phase projects. Such evaluations will then be done with an eye toward the priorities developed in the plan.

Benefits to the United States

Apart from addressing humanitarian concerns, the United States benefits in many ways from growth in productive capacity and concomitant economic improvements in developing countries. During the last two decades, our economy has become increasingly entwined with global economics, and developing countries nave become much more important in the worldwide economic picture. The more developed countries, which have been our traditional agricultural markets, provide little potential for increased imports of American food crops. In contrast, the developing countries, where four-fifths of the world's population now live and where population is growing the fastest, are our most rapidly increasing agricultural market. Among developing countries, those which have been major recipients of U.S. development assistance have increased their U.S. agricultural imports most rapidly.

There are good reasons why U.S. farmers should consider agricultural development assistance as a long-term support for export markets. As developing countries prosper and produce more agricultural commodities they also import more of both agricultural and non-agricultural products. There are a number of reasons why this occurs. First, history has shown that imports generally increase faster than income; during 1979-81, developing countries increased their U.S. imports by 13.6% while their per capita income increased only 10%.* Second, per capita consumption of food in developing countries increases faster than per capita food production; agricultural imports must increase to fill the gap. Third, as their incomes increase, people want a greater variety of better food than is available in their country, as well as products that cannot be locally produced. And last, as conditions improve, more infants survive and longevity increases, creating greater general demand.

Clearly, economic improvements in developing countries increase, rather than decrease, our agricultural export markets. In addition, our participation guarantees us access to new and improved technologies that are potentially valuable to U.S. farmers, and to gene banks in developing countries which house the preserved the genetic stock of both cultivated varieties and land races of the world's major crops. Gene bank accessions also include species and varieties of important crops and other plants that are threatened by extinction. By being involved in research that uses gene bank accessions, the United States is in a position to help determine which crops and other plant species are preserved. Scientific benefits also accrue to the U.S. land grant colleges and universities that participate in A.I.D.'s research, training and technical assistance projects abroad.

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* Arthur B. Mackie, ERS Staff Report No. AGES 830810-10/83

Conclusion

While some new technology can be developed in a short timespan and other achievements require more sustained commitments, it is clear that focussed research produces the desired results. But, we have only just begun. The agricultural problems in Africa are enormous and varied. Many more new and adapted technologies, and more widespread training will be needed if Africans are to achieve and sustain sufficient food production.

The ultimate objectives of U.S. assistance in food and agriculture are to enable countries to become self-reliant in food, assure food security, and achieve economic growth. Technology alone cannot do the entire job. Institutional innovations, policy supports, and infrastructure investments must occur if agriculture is to develop and benefits are to spread widely among rural populations. However, without the internal capacity to explore, develop and sustain improved agricultural technologies, few African countries will achieve the desired goals.

Mr. **Scheuer**. Thank you very much for your interesting testimony. I have a few questions, and I am sure Claudine Schneider will have a few.

You mentioned that you were going to concentrate your research efforts in your training institutions in maybe 6 or 8 countries and not in 45. What will this mean for the other 38 or 40 in which you are not working? How are you going to have the technology transfer, and how are you going to train the trainers and teach the teachers. How are you going to get to all of those countries eventually?

And a subset of that question is, since, as my colleague, Congresswoman Schneider, mentioned, 60 to 80 percent of the agricultural work is done by women, are you going to make a special effort to induce these countries to involve women in their agricultural extension programs so that women will be teaching women and will be able to communicate all kinds of things on a woman-to-woman basis, including not only how to grow more food but how many people that plot of land that she is tilling will support, and how she can achieve equilibrium between her food and her family, and perhaps talk with her also about a whole variety of ways that she can control her fertility to match the food that she and her family are producing?

Dr. **Brady**. Both of those are extremely important questions, and I certainly agree that they are priority issues that we have to face.

If I could take the first one in terms of concentration——

Mr. **Scheuer**. Take them both, because I will not ask any other questions. Then I will yield to Madam Schneider.

Dr. **Brady**. All right. On the concentration issue, we obviously cannot encourage 45 first-class agriculture research institutions in Africa. They cannot afford it. They simply cannot afford it.

So what we are trying to do is to work in ecological zones to select one or two that could afford, on a continuing basis, a first-class agriculture research setup, and let them sort of be the focal point of creating new technologies, but collaborate with the other five or six counties around in testing those technologies, so that the other countries will be involved in networks, working to begin with on commodities, on maize, on corn, on beans, on cassava, on forages for the animals to eat, on rice and so forth.

But the countries that cannot afford the development of a first-class institution, one that is going to create the new knowledge, will be tied in to these networks and will automatically have available to them the best that is coming out of either the international centers or these more highly specialized programs.

So we do not in any way intend to abandon those that are smaller countries that may not have the resources, but up to now, there has been a tendency for us to shoot with a shotgun instead of a rifle.

Mr. **Scheuer**. You think that if you organize your effort into regional efforts and concentrate the regional efforts with outreach and with the involvement of these countries and the training of their trainers and the teaching of their teachers, that you will get a bigger bang for the buck?

Dr. **Brady**. Oh, I don't think there is any question about it. We have done this in this country.

Every land-grant university does not have a veterinary college. A veterinary college in a given region, without being identified as a regional veterinary college, becomes a de facto regional veterinary college, because the people from the other states come.

Mr. **Scheuer**. Right.

Dr. **Brady**. And the same principle would hold here, you see. We would not establish these as regional universities, but if they had the quality, they would automatically become regional universities and would attract people from the other countries, instead of sending them to the United States and Europe, which only the rich people can take advantage of, in the first place.

And, in the second place, their training and education will be much more oriented toward their needs in Africa if the training can be done there.

Now, turning to the female question, I think the United States has generally taken the leadership among the donor countries in trying to increase focus on women. We have helped support regional conferences, not only the international one, which might have been somewhat more politically oriented than some of the others, but those that are focusing on the substance of what must be delivered in agriculture.

I am participating right now in a meeting of the Consultative Group on International Agriculture Research. For the last 2 days, we have been talking about the impact of these international centers. The one place where the impact has been inadequate, particularly in relation to Africa, relates to women.

In Asia, women are involved in training. In the country that I lived in for 8 years, there are now more females in the College of Agriculture in the University of the Philippines than there are males. The institute that I ran for 8 years, the best technicians we had were females, and that spread out into their extension service.

Well, that has not happened in Africa, and we continue to work with an establishment dominated by males who cannot deliver their services to females because their culture will not permit a man to go into the house and talk to a woman.

And so we are trying to bring about some changes, not only in terms of the attitude of the extension service and the mechanism by means of which women can be involved, but also, we have a network that we have established to work with the education ministers in about six different countries in Africa.

One of the primary objectives is to work with them to develop mechanisms by means of which females can be trained and can be qualified for these kinds of positions. We did not go in and ask the ministers of education to let us do this; they came to us and said, Can we get in? We set up a project, surely, but they came in and said, We would like to be part of that project, and we have had to say, in some cases, No, we simply cannot accommodate any more because of our resources.

So I don't think there is any question but what the process has started. Now, what we can do to accelerate it, we do not know. But I want you to know that we are aware of the problem; not only we but other donors, as we have talked to them, are likewise aware of it.

Incidentally, on this networking business for agriculture research that I just mentioned, I just participated in two meetings this week to try to get ourselves oriented to where other donors would join the World Bank and us in these intercountry networks, because there is no reason why the United States should pay for all of it. If the other donors are also putting money in there, we should develop the collaborative plan and all of us work together.

Mr. **Scheuer**. That is very interesting.

Last February, our subcommittee, on this same subject, visited Israel, and we went to the Ben-Gurion University in the Negev Desert and spent a day or two looking at their arid zone agricultural research, which to us was very impressive.

We tasted tomatoes that they were growing in brackish water, in salt water. Apparently they are working on a variety of plants that can be grown in salt water, which, of course, for all of the African countries except for those that are landlocked, which are in the minority, that would be a tremendous boon.

Where is the greatest, the finest work being done in arid zone agricultural research in terms, as you mentioned, of crops that are drought resistant, blight resistant, heat resistant, that do not require large inputs of fertilizer or irrigation, both of which are extremely capital intensive and energy intensive, and the crops that are appropriate for small-scale farmers? Where would you say that is taking place?

Dr. **Brady**. In terms of the countries, particularly in relation to its size, I don't think there is any country anywhere in the world that can excel Israel.

I have visited the same institute. I have seen the same research locations that you are talking about. I am personally acquainted with some of the scientists working in those areas. One of them is writing an article for me. I happen to be editor of Advances in Agronomy, and they are writing an article relating to their experience in irrigation, where water is really of critical value and where you don't have too much of it.

So I agree with you. And, quite frankly, we are, as you know, interacting with the Israelis in trying to get linkage projects between Israeli scientists and those overseas in the developing countries. And in a very short time, we find there is surprising interest on both sides for this kind of interaction.

We are doing our best to be sure that we try to keep this as an interaction between scientists and not between governments, because that immediately gets us into the political arena. But I want to let you know that we are making use of the expertise in Israel.

Second, though, I would point out that——

Mr. **Scheuer**. Can I interrupt you there?

Dr. **Brady**. Please.

Mr. **Scheuer**. Is there any possibility of getting interaction between the Israeli scientists and scientists in other Arab country research centers? I am sure that in Egypt and Syria and Jordan and other countries, they must be working on these problems, too. Is it possible, under the political conditions that exist, that you could be the "fairy godfather," perhaps, in getting regional cooperative scientific projects in arid zone agricultural research undertaken jointly, for example, so that they can share their talent, share their know-how, share their progress, for the benefit of all the countries in the region?

Dr. **Brady**. This is being done involving Israel and Egypt. It is a little touchy at times because of the political ramifications. But primarily through interaction with the U.S. Department of Agriculture—and I want to give them full credit for helping to bring about these linkages— the linkages are there.

They are carrying out research work, both in Israel and in Egypt, and I already see changes that are taking place, particularly with regard to the management of some of their vegetable crops in Egypt that come directly from what the Israelis have done.

Likewise, very similar patterns are under way in Jordan. I don't want to indicate that there is any formal relationship, but de facto, there is this kind of relationship.

We have found some governments simply unwilling to go into any kind of formal relationship or to allow their scientists to go into a formal relationship with Israel.

Mr. **Scheuer**. Let's keep it informal.

Dr. **Brady**. Keep it informal, that is exactly right, and that is the reason I would argue—and, incidentally, I think there is a bill relating to this that does talk about us working these relationships out with governments, and I think it is to our disadvantage. The degree to which we get governments involved versus the scientists is to our long-term disadvantage.

Mr. **Scheuer**. Would you rather have some discretionary funding that would have as its goal promoting informal scientific cooperative efforts between scientists across national lines, where you could work out informally the partnerships?

Dr. **Brady**. Great. As a matter of fact, Mr. Chairman, up until this time, that is how we have used the funds that we have gotten. But I think there is an attempt to try to—with perfectly good reasons, perhaps, on the political side—to try to have us have these projects sort of approved by the governments, and that is, I think, to our disadvantage to have this happen.

But let me mention one other thing. Because of the fact that we recognize there are some problems with Israeli scientists being permitted to collaborate with their counterparts in the Arab countries, we have successfully—the Near East Bureau of the agency—set up a project with the——

Mr. **Scheuer**. Of which Bureau? Of AID?

Dr. **Brady**. Of AID, of USAID. It was the Near East Bureau there. Now it is the Asia Near East Bureau. We have set up a network of scientists in these various countries that includes the Arabic countries, and we are funding this through the International Center on Arid Zone Research. It is part of this International Agriculture Research Centers Group.

It is located in Syria. No money goes to the Syrian government. It is the same as—we have one located in Ethiopia on animals. These international centers are not there to help the governments. But it is true that these countries have all agreed to work with ICARDA—that is the name of the center—and already a drylands network has been established, and I just talked to one of my colleagues from Germany yesterday, indicating that he is going to be putting some money in to help with this.

And so we are doing everything we can, and the degree to which Egypt would be involved would automatically bring in some of the Israeli findings. But we have to recognize that there are some overriding political constraints that have to be considered here.

Mr. SCHEUER. We have heard of them, too.

All right, that was extremely interesting. An equally extensive 5 minutes for my distinguished colleague, Congresswoman Claudine Schneider.

Miss SCHNEIDER. Thank you.

I am delighted, Dr. Brady, that you are aware of the role that women are playing in Africa, in particular in agriculture, and I am delighted that you are going to target training programs toward women and make a specific effort with the powers-that-be.

I wonder, have you made any contacts as yet in pursuing this effort?

Dr. BRADY. As I indicated, the network relating to the training of people has already been established. I have been invited to go to Botswana next month to participate in an international conference where the results will be discussed.

Miss SCHNEIDER. Where the results of what will be discussed?

Dr. BRADY. The results of this network where we are providing professional backstopping to educational ministries in the various countries of Africa.

One of our prime objectives is to get them to develop some strategies by means of which more women will be trained.

Miss SCHNEIDER. Well, let me say that I hope that your efforts to get them to develop strategies are more successful than the men in this country have been in getting fellow male members in decision-making positions to develop strategies to enable equal opportunities for women in education.

One thing you may not be aware of, or other members of this gathering, is that at this very moment women's educational opportunities are being threatened, and the Department of Education has before it at least 61 different cases in which they are looking at doors being closed to women.

It was not until 1972 that this country and this government finally decided that they were going to give women an equal opportunity to educational programs. To give you a specific example in the area of agriculture, Cornell School of Agriculture required that women have SAT scores 30 or 40 points higher than the men in order to be admitted to Cornell School of Agriculture.

Now, I hope that in your efforts to make it clear that our government is willing to provide financial support, research, information, technical training, that we do not want to see the same kind of discrimination take place in Africa as is taking place right now in the United States. We want to try to achieve higher goals wherever we can, if not in this country, then elsewhere.

I was wondering about the agricultural centers that you were discussing. What is the time and the place? You mentioned Botswana as the center for the conference, is that right?

Dr. BRADY. That is the education conference.

Miss SCHNEIDER. All right. Well, where will some of the agricultural centers that you are referring to—what is the timing on getting those established and where will they be?

Dr. **Brady**. The agricultural centers are a group of 13 centers that have been—the first one was established in 1960. I had the privilege of heading that center from 1973 to 1981. It dealt with rice. And, incidentally, just this last year it was the host of an inter-center program, conference, relating to Women in Development, and it is the center that I was telling you where a majority of the technical people among the Filipinos are in fact women. But they are holding a meeting right now.

Their Consultative Group on International Agriculture Research sponsors these centers.

Miss **Schneider**. Where is the center closest to Kenya?

Dr. **Brady**. The center closest to Kenya?

Miss **Schneider**. Or is there one within Kenya?

Dr. **Brady**. There are two centers that are allied to this formal grouping, one located in Kenya, the International Council on Research on Agroforestry. A second is the International Center on Insect Physiology and Ecology. Number three that is a part of the formal programming is the International Laboratory for Research on Animal Diseases.

So there are three of them. Their representatives, their heads, are over at the World Bank right now participating in this meeting. They come in every year for this annual one week working with these international centers.

This is a copy of a summary of an impact study that has been made by an internal group. It happened that the advisory group was chaired by Frank Press of the National Academy of Sciences, and I will be glad to leave copies of this available for you.

Miss **Schneider**. That would be appreciated.

[The material follows:]

Summary of

Consultative Group on International Agricultural Research

The CGIAR centers

CIAT	**Centro Internacional de Agricultura Tropical** (International Center of Tropical Agriculture) Cali, Colombia
CIMMYT	**Centro Internacional de Mejoramiento de Maiz y Trigo** (International Maize and Wheat Improvement Center) Mexico City, Mexico
CIP	**Centro Internacional de la Papa** (International Potato Center) Lima, Peru
IBPGR	**International Board for Plant Genetic Resources** Rome, Italy
ICARDA	**International Center for Agricultural Research in the Dry Areas** Aleppo, Syria
ICRISAT	**International Crops Research Institute for the Semi-Arid Tropics** Hyderabad, India
IFPRI	**International Food Policy Research Institute** Washington, D.C., USA
IITA	**International Institute of Tropical Agriculture** Ibadan, Nigeria
ILCA	**International Livestock Center for Africa** Addis Ababa, Ethiopia
ILRAD	**International Laboratory for Research on Animal Diseases** Nairobi, Kenya
IRRI	**International Rice Research Institute** Manila, Philippines
ISNAR	**International Service for National Agricultural Research** The Hague, Netherlands
WARDA	**West Africa Rice Development Association** Monrovia, Liberia

Foreword

It is appropriate that the CGIAR decided to commission a study of the effects that the centers it supports have had on agricultural research institutions and agricultural production in the Third World.

The external committee appointed to advise on the conduct of the study wishes to raise some issues on its own, and to acknowledge those whose wisdom, foresight, and hard work led to the initiation and successful conclusion of this study.

A word about the role of the advisory committee and the process is in order. Its members were broadly drawn from diverse disciplines and institutions, with varied national backgrounds. The committee functioned as a support group to the director, Jock Anderson, in the design and organization of the study and as a reviewing body at intermediate and final stages. The process worked well—the advisory committee is pleased with and fully endorses the product. The committee was impressed with the high degree of professionalism and the organizational skills of the director, and has the highest regard for the manner in which he interacted with the committee, assembled his team, and carried out this difficult charge. The director enjoyed especially strong support in executing the project from Robert Herdt, who carried staff responsibility for the study within the CG Secretariat and also interacted most successfully with the committee.

The CGIAR was launched shortly after the first days of the "green revolution" when semi-dwarf wheat and rice varieties, developed by the first two centers, were spreading rapidly and when the world's attention was focused on the food crisis in Asia. The descendants of these varieties, developed cooperatively with the national programs, remain the largest contribution of the system, and that is large indeed. There are indications that the centers' work on other commodities is also beginning to pay off. Center-related maize varieties have spread to over 6 million hectares in developing countries; new bean varieties are spreading, improved potato clones are being used, and new cowpeas are being grown by African farmers. The system has made a major contribution through training to increasing the capacity of developing countries to conduct research. These contributions alone demonstrate the enormous utility of a coordinated world system of agricultural research and training.

The wheat and rice breakthroughs were based on a backlog of basic knowledge in the plant sciences that is not so readily applied to dryland crops, which are particularly important in parts of Africa, the center of today's food crisis. Wheat and paddy rice are grown on large, rather homogeneous areas while sorghum, millet, cassava, and the various food legumes are dispersed across a wide diversity of ecosystems.

The world's attention is now focused on the profound problem of food in Africa. The causes are manifold: drought, strife, population growth, political imperatives, policy decisions, and world economic conditions all contribute. The CGIAR centers are devoting a substantial part of their resources to these problems: four centers are located in Sub-Saharan Africa, as is the sub-center of another. The impact of their work has thus far been modest, especially compared with the impact of the semi-dwarf wheat and rice varieties. This is to be expected in view of the scientific and technical difficulties let alone the other factors responsible for famine.

The committee believes that, in the years ahead, the conditions that led to the initial successes of the CGIAR system will be changing. Many developing countries have organized national research systems (to a considerable extent spurred by the success of the international centers) with the ability to conduct adaptive research. More will do so in the years ahead. It will require bold steps to shift the research focus and the structures of many of the centers from classical adaptive research on specific varieties to the supply of new methods and new breeding materials, many based on the rapidly developing methods of genetic engineering and biotechnology. This involves a changing emphasis from highly applied to more basic research. It also involves enhanced links between the centers and the forefront national laboratories in molecular genetics. These links will be effective only if the centers have staff members trained in these new techniques.

Agricultural science in the 1980s is in a state of rapid transition. Genetic engineering and other tools of biotechnology promise to greatly increase the potential gains from investment in research. Significant advances in molecular genetics, relevant to the work of the centers, have involved discoveries of ways in which the genetic material can be manipulated in animals, plants, and microorganisms. Since a great deal of the work of the centers concerns the exploitation of germplasm in plant breeding, they must take the earliest possible advantage of the new technologies. This is especially important since the time required to bring new knowledge into practice is now much shorter, and entirely novel crop characteristics can be created. The CGIAR centers will have to pursue these new avenues of research in addition to or in place of their current activities if they are to expeditiously meet their primary responsibilities to alleviate hunger in the Third World.

It was understandable to address the problem of food production on an emergency basis at a time when millions of people in Asia and elsewhere were faced with almost certain prospects of undernourishment and hunger. These dangers still exist not only for people in large parts of Africa but among the poorer strata of society everywhere. Nevertheless, it is important that problems of food supply are also tackled bearing in mind the longer-term perspective of preserving vital ecological balance and protecting the environment. Short-term gains which jeopardize longer-term goals cannot have a place in an integrated strategy for meeting basic needs worldwide on a sustainable basis.

It has been recognized for decades that there is a need for the development of appropriate technologies that might permit sustainable use of lands subjected to slash-and-burn systems and the other forest removal techniques. Population pressures and numerous other factors have been dramatically increasing the intensity of deterioration of tropical environments. The extreme situation is posed by those millions of small-scale and marginal farmers trapped on degraded lands and lacking new areas or productive lands to which to move.

The international centers and those that sponsor, guide, and finance the centers do have a profound interest in the development of systems that can contribute to alleviation of pressures on remaining tropical forests and fragile environments, permitting sustainable agriculture and animal husbandry on cleared lands (thereby reducing further destruction). Consideration must be given to appropriate arrangements for research to help national institutions to develop management methods, technologies, and policies for sustainable agriculture, animal husbandry, plantation forestry or agroforestry, and rehabilitation of degraded tropical areas.

A case can be made that research should not focus exclusively on food crops. The principle of division of labor and mutually beneficial trade applies as much to agriculture as to anything else, and it may make sense for farmers in many poor regions to specialize in commercial crops rather than in food production so as to maximize their incomes as well as the chances of feeding the entire population in the region on an economical basis. The role of international centers, vis-a-vis national centers in research on commercial crops needs to be worked out in order to meet the needs of poor farmers, bearing in mind the crops they are best suited to produce.

Finally, it cannot be overstated that the work of the centers is of benefit not just to the developing countries. It is an aspect of the growing interdependence of all nations that anything which contributes to the well-being of large numbers of people anywhere tends also to benefit the rest of the world. This is perhaps more true of scientific and technological progress than anything else.

Frank Press
Chairman, Advisory Committee

In brief: Conclusions from the study

The international agricultural research centers were conceived as a mechanism that could draw upon the global stock of knowledge, scientific talent, and plant material to address some of the urgent needs of developing countries. By the 1960s, when the first centers were established, it had become clear that growth in agricultural productivity could not be achieved simply by transferring technology to developing countries. Progress could only result from the generation and diffusion of technologies relevant to local ecologies and economies.

The early work with national research programs emphasized training and germplasm collection and improvement. As the center system has evolved and new centers have been created, attention has spread to a wider range of environmental conditions, more crops and livestock species, and more soil and pest complexes. The importance of adaptation of new technologies to specific local conditions has grown. As the focus has shifted, the 13 centers have increasingly established close working relations with their national counterparts. The trend toward closer ties has been facilitated by the rising scientific quality of national programs, which is the result of larger national budgets for research and, in part, assistance and training provided by the centers.

The study of the 13 international centers attempted to assess the changes that had been accomplished through the existence of the centers and to document the perceptions that researchers in developing countries hold about the centers' work. The major conclusions of the study:

1. The system of agricultural research centers that are supported by the CGIAR provides critical ingredients—both material and intellectual—that have helped many developing countries to reap high returns from technological investigation. The centers have provided a vehicle for transferring innovations based on crop germplasm from country to country along with the knowledge of how to adapt such innovations to local conditions and how to achieve further advances. **If the system of centers did not exist, something very much like it would have to be invented.**

2. Most of the tangible economic benefits of the CGIAR system trace to the modern wheat and rice varieties developed by national programs in part from genetic materials provided by the centers. Modern varieties cover 115 million hectares or half the total plantings of wheat and rice in the developing world. Since they were first adopted by farmers in the mid-1960s, center-related wheat and rice varieties have spread rapidly in most developing countries where the crops are grown. They do best with irrigation, but as researchers produce more specifically adapted varieties, substantial areas of rainfed land are being affected. These varieties annually yield about 50 million tons more than the old varieties would have produced, enough to provide food grain for about 500 million people.

3. Varieties of maize and field beans derived from genetic material provided by the centers are beginning to have a measurable impact on food production. Developing countries have released over 200 center-related maize varieties, and over 6 million hectares are planted to them. Nearly 100 center-related bean varieties have been released. About half the field beans planted in Argentina, Costa Rica, Cuba, and Guatemala are center-related varieties.

Over 250 center-related varieties of sorghum, potato, cassava, chickpea, cowpea, pasture species, pearl millet, pigeonpea, and durum wheat have been named by national authorities. The area planted to them is still small because many of these varieties have been released only since 1980.

4. The benefits from adopting modern varieties have been remarkably evenly distributed among farmers differing in size of holding and tenure status. A major part of the gain from the new technology has accrued to food consumers both rural and urban. Food makes up 60 percent or more of the expenditures of the poorest people in most developing countries. Consequently, reductions in the real price of rice and wheat, such as those brought about by technological change, favor the poor more than the affluent, who spend a smaller share of their incomes on food. But in terms of the overall distribution of real incomes, these improvements are marginal. Technological advance, while vital for the development of agriculture and the economy, is a poor instrument for redistributing wealth.

5. Agricultural research is a time-consuming and uncertain undertaking. Despite the record of high returns to investment in research, few small countries can afford to mount productive research programs on all fronts, particularly if their agriculture is diverse. For these countries in particular, **the centers' role as a provider of biological material and scientific resources, will continue to be required well into the future.** In fact, some national scientists have urged that it expand to embrace more crops and livestock species. Furthermore, in the difficult and resource-poor institutional environments that prevail in many countries, the kind of assistance provided by the centers is very valuable to national programs.

6. The type of contribution made by the centers is related to the stage of development and the capacity of the national system. Countries with thin research capacity benefit by directly adopting technologies produced by the centers; countries with moderate capacity carry out some adaptive research on centers' products to produce their own technologies; while countries with strong research capacity are mostly interested in the ability of the international centers to deliver research products specific to some of their individual problems.

7. In their chief enterprise, the improvement of germplasm, the centers are responsive and fair in dealing with their collaborators and their often conflicting priorities. **Plant genetic collection and conservation by developing countries have been greatly stimulated by the IBPGR and other CGIAR centers.** Genebanks now hold substantial collections of most major crops. During the past 10 years, seeds of 138 crop species have been collected in 88 countries in over 300 missions promoted and partly financed by IBPGR. The materials collected have been placed in the genebanks of 450 organizations, more than half of which are in the developing world. But the centers may be underutilizing the wild relatives of some crops. They also could be more active in exploring the uncertain promise of biotechnology for unlocking the potential of these collections.

8. The centers have raised the capabilities of thousands of research personnel in developing countries through their training programs. Even courses lasting only a few weeks are well regarded by the participants and seem effective in enhancing research productivity.

9. The crops, livestock species, ecologies, and issues that form the individual mandates of the centers differ markedly. **For many centers, the challenges that they face are so perplexing and the constraints imposed by poor infrastructure, depressed commodity prices, lack of agricultural inputs, and low levels of knowledge are so difficult that it is too soon to expect impressive returns from their work.**

10. The centers' emphasis on the human aspects of technological advances has grown as interest in farming systems research has spread. Nonetheless important areas such as the problems of female farmers in male-dominated societies and the limited presence of women in research organizations have hardly been touched.

11. The centers' research on policy issues is helping national authorities to correct faulty perceptions and to argue against unwise decisions affecting food production and consumption. But considering the magnitude of the problems, the centers' efforts can address only a fraction of the vital questions. The political as well as economic aspects of policy making must be confronted by the countries themselves in order to accelerate agricultural advances.

12. The collaborative arrangements between the centers and research workers in developing countries have been demonstrably productive. One of the most appreciated activities of the centers is the effort that they make to overcome the barriers that often isolate researchers in developing countries from the global knowledge system and the international scientific community.

Partners in Research

Better plants

Wheat and rice. The rapid spread of modern varieties of rice and wheat attests to the power of the research engine formed by the joined efforts of the international centers and national research agencies. These varieties, mostly released since 1965, handsomely rewarded farmers who invested extra effort in good management.

Multitudes of farmers throughout the world have exploited the genetic potential of the new varieties. They plant modern wheat varieties on 47 million hectares or nearly 50 percent of the wheat area of developing countries. Modern rice varieties cover 70 million hectares or about 55 percent of the rice land in developing countries. China alone accounts for about 32 million hectares of the new rices. (Breeders there developed short, fertilizer-responsive varieties without IRRI assistance in the 1960s, but in the 1970s they began extensive use of IRRI-developed varieties for their newest hybrid rices.)

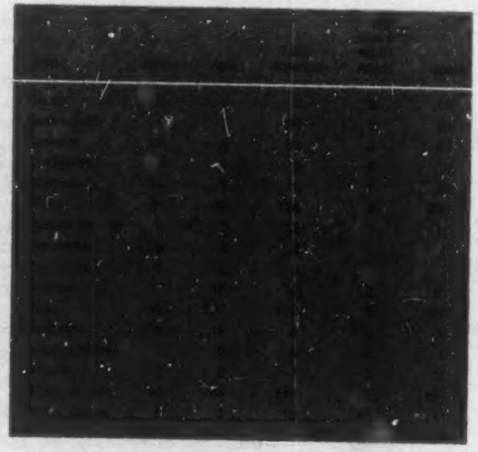
For most adopting farmers, the new varieties typically outyield the old varieties by 400 to 500 kilograms per hectare. Thus, worldwide, they annually provide over 50 million tons of additional food. That is a quantity about equal to the annual grain consumption of a half billion people.

Other crops. Developing nations have released over 200 maize varieties developed from genetic materials supplied by the centers. Half of these varieties are grown in Latin America, with the rest

about equally divided between Africa and Asia. The new varieties cover 6 million hectares in over 15 countries. CIMMYT's Tuxpeño group of maize lines has been notable for disease resistance. The incorporation of resistance to streak virus in some new maizes by IITA gives them special promise for Africa.

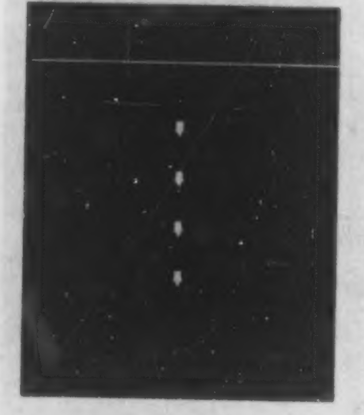
More than 90 CIAT-related varieties of field beans have been released by authorities in 23 developing countries since 1981. Little information on their spread has accumulated so far, but three recent studies

New varieties: Number of center-related varieties released by national authorities in developing countries through 1983.



have shown that 35 to 65 percent of the bean areas in Argentina, Cuba, Costa Rica, and Guatemala are planted to the new varieties.

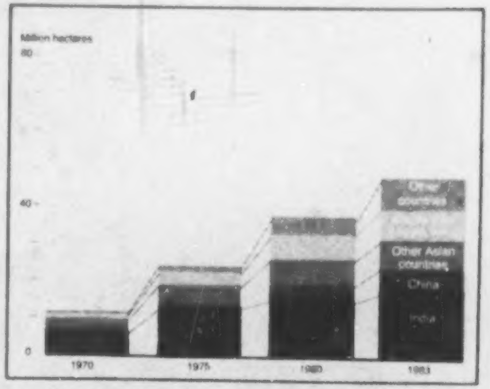
Over 60 center-related cassava varieties have been released by 16 countries in Africa, Asia, and Latin America; over 30 sorghum varieties and eight pearl millet varieties derived from ICRISAT's research have been released in more than a dozen countries; 29 varieties of cowpeas derived from IITA's research are known to have been named by national authorities, half in African countries; over 40 varieties of durum wheat related to CIMMYT and ICARDA research have been released, mainly in the Middle East and North Africa where durum is a principal staple; 23 countries have released over 60 potato varieties obtained and tested with CIP's assistance. Varieties of chickpeas, pigeonpeas, barley, triticale, and pasture and forage crops derived from center efforts are also being released and are beginning to reach farmers.



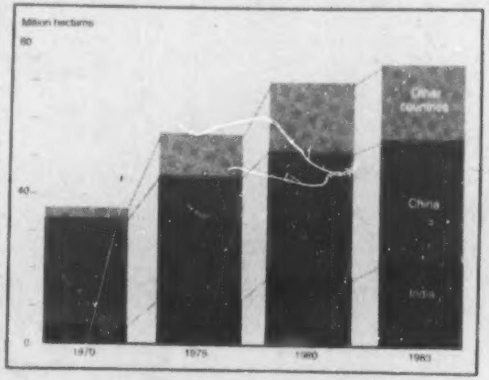
The plant improvement process. The process of plant improvement is laborious and, inevitably, time-consuming. The initial steps in the development of new crop varieties are to collect and characterize germplasm—farmers' varieties, wild strains, and related species—and to assess farmers' needs in order to set breeding priorities. From data on the genetic materials and from examination of growing plants, the breeders choose, as parents for crosses, plants that have characteristics that they hope to combine in offspring. After the first cross, the progeny exhibit widely divergent characteristics as a result of genetic segregation. Breeders choose progeny with desirable characteristics and plant their seeds to form the next generation, or they may use selected plants to make additional crosses. By deliberately exposing the plants to high populations of insect pests, to high incidence of disease pathogens, or to other stresses, the breeder can cull inferior plants—the so-called screening process.

After five to seven generations (many breeders grow two generations a year), lines that have survived intense environmental stresses and the breeder's unforgiving eye undergo preliminary yield testing. The lines are usually grown at several locations to get data on their reactions to different soils, climatic patterns, and complexes of diseases and insects. The international centers with crop improve-

Land in new wheats: Estimated area planted to modern wheat varieties in developing countries.



Land in new rices: Estimated area planted to modern rice varieties in developing countries.



ment programs may carry out all the above steps, as do some developing countries that have large research capacity. Centers normally enter their most promising materials into international tests, or nurseries, that are distributed to national breeders who request them.

National researchers who have responsibilities for developing finished varieties may evaluate lines or varieties from international nurseries for their domestic suitability, or they may produce their own crosses using germplasm from domestic and international sources. The former approach involves somewhat fewer steps within the country, but still takes additional time.

Whether at a center or in a national program, the minimum time between beginning the process and the identification of a promising line is 6 to 14 years. Countries that rely on breeding done at centers typically require an additional 3 to 6 years for in-country testing and release. Seed multiplication must then follow.

Improved farming methods

Research on improved methods and materials for production is an important part of the work of the centers. Diverse products result: new machines, procedures for better management of experiment stations, and methods of producing disease-free planting material are some examples. Only a few technologies have reached widespread use among farmers so far.

Crop intensification. Most traditional varieties are sensitive to daylength,

The work of the centers

Diversity. The 13 centers that constitute the CGIAR system were established at different times by different sponsors with different objectives. IRRI, CIMMYT, CIAT and IITA were in operation before the CGIAR existed.

The centers are a heterogeneous group. They work on different commodities and problems and, in many instances, serve different regions. Eight of the centers are heavily involved in crop improvement work. Four centers focus on a particular region. Nine operate some form of farming systems program. Two are devoted to livestock research and another two include research on pasture or forage crops in their activities. Three have no laboratories or experimental fields because their work is directed to people and policies.

All centers are problem-focused. Thus to find solutions quickly, most use a multidisciplinary approach.

The centers are international in more ways than simply working with many nations. Their staff members are recruited worldwide. [illegible]

Staff members of the centers [illegible] headquarters.

In staffing the centers, a guiding principle has been to hire the best qualified professionals that can be found and to provide them with high quality facilities and adequate support and supplies to carry out first-class scientific work.

Each center determines its own program. The Technical Advisory Committee of the CGIAR periodically examines the programs of the centers and comments on the research priorities being pursued, but it has no direct control over the centers. Since they are also independent of governments, the centers operate relatively unfettered by externally imposed red tape.

Objectives. Most scientific activities at the centers can be classified as applied research. Basic research is rarely undertaken except where it is necessary for the solution of a specific problem. Crop improvement, in its various aspects, occupies the majority of the senior staff. About 15 to 30 percent are engaged in other applied research activities such as agronomy, economics, engineering, farming systems, and animal nutrition.

Cereals that provide 60 percent of the food energy consumed by people in developing countries dominate the research activities of the CGIAR centers. The centers also conduct research on the most significant root and tuber crops. In addition, livestock problems in Africa are addressed by two centers. Overall, the foods that contribute three fourths of the food energy and three fourths of the protein of diets in developing countries are under investigation by the centers.

Regional emphasis. Of the centers' staff members who are posted outside their headquarters, about 40 percent are in Sub-Saharan Africa, about 25 percent in Latin America.

Participants in centers' training programs, [illegible]

	[illegible]	Degree	[illegible]	Post-doctoral	Total
Sub-Saharan Africa	6248	300	[illegible]	160	[illegible]
Middle East & North Africa	307	47	71	7	[illegible]
Asia	[illegible]	907	516	282	[illegible]
Latin America	[illegible]	245	1427	77	[illegible]
Developed nations	2155	218	155	210	2738
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

which means that they do not flower until some critical number of hours of daylight occurs. Thus planting traditional varieties in the "off-season" makes little sense because grain will not set until the time of year when the critical daylength occurs. Most modern wheat and rice varieties, however, are daylength-insensitive—the length of the period from planting to harvest is rather fixed regardless of season. And the newer varieties of wheat and rice have been bred to mature even more rapidly without sacrificing yield.

Fast-maturing varieties and improved practices have enabled some farmers to squeeze in an extra crop during the year. For instance, the introduction of modern wheat varieties in Bangladesh permitted wheat to be planted in the winter when most farmers have too little water to grow rice. Unlike traditional wheat varieties, the new wheats flower and ripen during the short days of winter, so they can be harvested before the next season for planting rice arrives.

Bangladesh now grows half a million hectares of wheat, nearly all in modern varieties, which is 10 times the area harvested before the advent of modern varieties. This remarkable increase was achieved without abandoning other crops. During the 1970s, double- and triple-cropped land rose by 1.9 million hectares. Multiple-cropped land fell in 1971 and 1972, following the uncertainties of the liberation movement. Thereafter, as conditions stabilized, it increased to new, higher levels. Although expansion of irrigation promotes multiple cropping, in Bangladesh over 60 percent of the new wheat area lacks irrigation—the crop

and 20 percent in Asia. In terms of crops, about 40 percent of the investment in rice research is directed toward problems in Asia, about 50 percent of the research investment in roots and tubers is directed toward Africa, and 60 percent of the research investment in food legumes is directed toward West Africa, North Africa, the Middle East, and India.

Links with national programs. The centers and the national programs are linked through a variety of means: training, research networks, flows of information, and meetings and conferences. Formal training courses last from 2 weeks to 6 months and usually focus on specific research skills. Close ties are often formed between researchers in the centers and national programs through thesis-related research, individualized training programs, and post-doctoral appointments at the centers. At any time, there are about 360 candidates for master's and doctoral degrees who are conducting their thesis research at the centers.

Research networks take many forms: some involve germplasm exchange, others are organized around specific research problems. The centers make library services available to national researchers along with a broad range of specialized publications produced by the centers. For some researchers in national programs, the centers are their primary source of scientific information.

Information programs. Information development and distribution is a high priority of the centers. Each center produces publications and other information materials aimed principally at researchers and policy makers in national and regional programs. Other important audiences include extension program personnel, students of agriculture, and donors. To date, an estimated 10,000 titles have been produced on subjects covering a dozen commodities and two dozen scientific disciplines.

The centers' annual reports serve the function of communicating research results to national programs, while their research highlights are aimed more at helping policy makers and donors keep abreast of centers' activities. A variety of specialized publications concentrate on a specific discipline or geographic area or expand on a highly technical subject. Included are monographs based on completed research projects, bibliographies derived from center databases, and proceedings of international workshops and symposia. The centers also publish about 30 newsletters. Some centers routinely produce publications in Spanish or French, as well as English.

Growth of the system. The CGIAR was launched in 1971 when there were four centers already in existence whose budgets totaled $18 million. By 1984, the 13 centers in the CGIAR had budgets totaling nearly $180 million. During that period, the number of donors contributing to the system rose from 16 to 35, including several developing countries. Compared with changes in official development assistance for agriculture during the past 15 years, the growth of expenditures on the centers has been rapid. But the total budget of the CGIAR system is a small fraction of all expenditures on agricultural research by developing countries.

Development funding: Official development assistance to developing countries, national agricultural research expenditures, and expenditures of the CGIAR centers.

	1970	1980	1982
	($ millions, 1981 constant dollars)		
Official development assistance	21,300	36,200	35,000
Bilateral	18,500	28,600	27,400
Multilateral	2,800	7,600	7,600
Grants by PVOs	2,200	2,200	2,400
National agricultural research, world	5,400	7,400	n.a.
North America, Oceania, W. Europe	2,400	3,200	n.a.
USSR and E. Europe	1,300	1,600	n.a.
Developing countries	1,700	2,700	n.a.
CGIAR expenditures	20	140	140

Wheat: The adoption of modern varieties.

Rice: The adoption of modern varieties.

grows on residual soil moisture and water from the occasional winter rains.

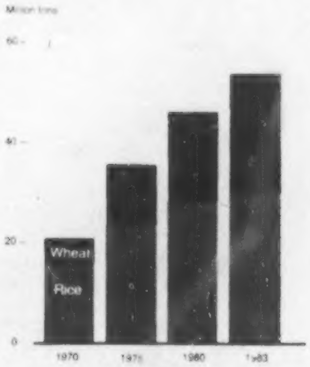
Cassava cultivation. Cuban cassava production has expanded by a factor of 15 during the past decade, chiefly owing to new methods for cassava production developed by Cuban agronomists working with CIAT and popularly known as the "Colombian system."

Since cassava is a relatively new crop for them, Cuban farmers have managed it like sugarcane, planting short stakes horizontally in furrows and irrigating heavily. With the help of CIAT, Cuban researchers evaluated the cassava varieties being grown by farmers and selected the best ones for propagation and diffusion. They also developed improved practices: cutting the planting stakes longer and chemically treating them to suppress bacterial blight, thoroughly preparing the field with higher ridges than those customarily used for sugarcane, placing the planting stakes vertically at the top of the ridges, controlling weeds in time, and irrigating moderately. On state farms, which have 10,000 hectares of cassava, or a fifth of the nation's cassava land, yields have climbed to 20 tons a hectare from 7 tons a hectare.

Threshers. Commercially produced rice threshers manufactured from designs developed by IRRI have significantly reduced costs for many farmers in the Philippines and Thailand, and thus promoted increases in output. In the Philippines, the threshers are replacing manual threshing and foot treading, which may have disrupted employment opportunities, especially for female threshers. Although the per ton cost of threshing remains much the same, threshers have reduced losses of grain during threshing. In contrast, in Thailand, where the IRRI threshers are replacing tractor treading or driving repeatedly over the grain with tractors, farmers suffer slightly higher threshing losses, but the costs are lower.

Seed potato storage. CIP researchers have promoted the evaluation and adoption of diffused light storage for seed potatoes in many developing countries. Although farmers in many areas conventionally store seed potatoes in the dark, storage in diffused natural light slows sprout elongation, increases sprout numbers, and reduces storage losses. Farmers

More food: Estimated additional food grain produced by modern wheat and rice varieties.



get higher yields because of the greater sprout vigor of the seed potatoes, and they benefit from being able to store seed potatoes longer, so they can time their planting to place the harvest in a period when the markets are less likely to be oversupplied with potatoes.

This storage system is being used extensively in Peru, Colombia, the Philippines, and Sri Lanka and has been introduced in other countries. On-farm trials in Peru, Colombia, and the Philippines showed that diffused light storage of seed potatoes resulted in yield gains of 8 to 20 percent. Trials in Sri Lanka showed yield increases of 80 to 133 percent. If a 20-percent yield increase occurred on 10 percent of the potato land in the countries where CIP is actively promoting the technology, the result would be an additional 1 million tons of potatoes worth about $100 million a year.

Deep Vertisol technology. ICRISAT has developed improved production practices for deep Vertisol soils in the higher rainfall areas of semi-arid India. The broadbed-and-furrow system involves land leveling and shaping, construction of field and community drains, tillage following the harvest of the winter crop, use of graded beds and furrows, dry seeding of modern varieties before the monsoon, moderate application of fertilizer, and timely plant protection. Most of the practices are best carried out with a bullock-drawn wheeled tool carrier, which would be a substantial expense for poor farmers. Yet, trials conducted in several states of India have shown that the composite technology is profitable. By 1983 the broadbed-and-furrow system was in use on about 4000 hectares, mostly on farms operated by state governments. The technology seems well-suited for up to 5 million hectares.

Azolla. Farmers in China and Vietnam cultivate azolla, an aquatic fern, in rice paddies as a green manure crop. It improves soil fertility because it provides a home for nitrogen-fixing micro-organisms. However, azolla works best on soils that have high levels of available phosphorus and where careful water management is possible.

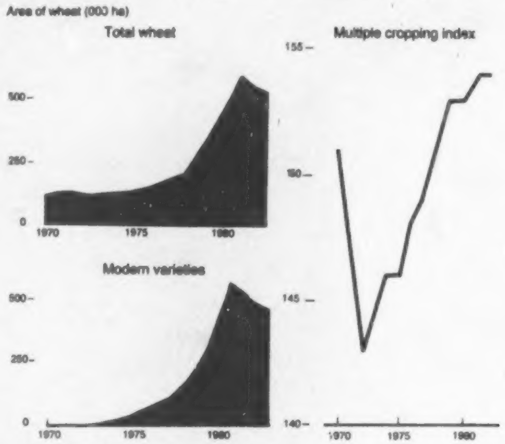
IRRI is promoting the use of azolla to help farmers to lower their fertilizer expenditures. Vietnam and China are using some strains in this way, and IRRI has fostered the exchange of azolla strains among other countries.

A study in the southern Philippines in 1981 found azolla being cultivated on 5000 hectares of irrigated rice lands. Farmers who used azolla were able to cut the use of nitrogen fertilizer from about 40 kilograms per hectare to 20 kilograms per hectare without lowering yields.

Distribution of benefits

The economic position of the very poor, who have few assets other than their own labor, is undermined by population growth, unequal land ownership, and global, political, and technological trends that reduce the prices of such things as tractors, weed killers, and imported dairy products. The poor would have been even worse off without modern wheat and rice varieties, which made possible increased cropping intensity, raised labor demand, and lowered food-grain prices. Most other innovations related to the centers' work have not yet been adopted widely enough to have measurable impacts.

Spread of wheat in Bangladesh: Fast-maturing modern wheat varieties have enabled farmers in Bangladesh to increase cropping intensity and to expand total wheat area nearly five-fold.



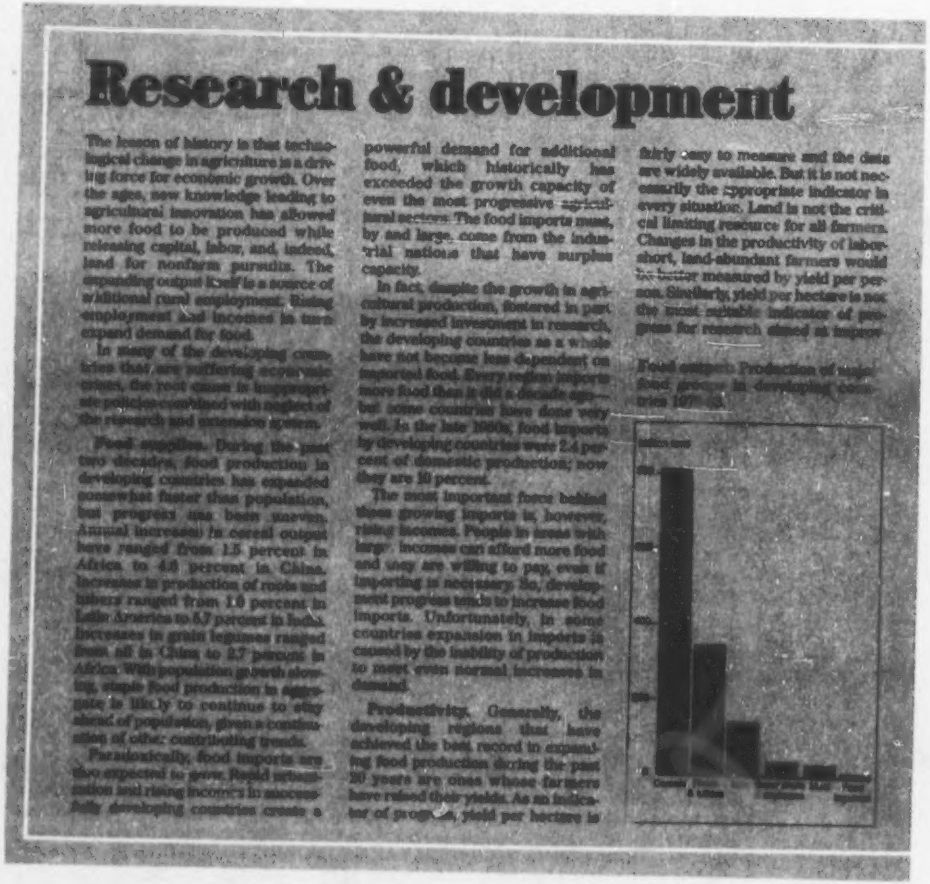
Modern varieties and the poor. The advent of modern varieties has affected the poor by changing their technological options. Modern varieties are more responsive to fertilizer than traditional varieties, making investment in fertilizer highly profitable. For farmers who use fertilizer, the yield advantage of modern varieties has grown as their resistance to insects and diseases has broadened, even in areas where the crop is subject to periodic dry spells. Contrary to some notions, modern varieties yield better than most traditional varieties even without fertilizer.

Another reason behind the widespread adoption of modern varieties is quick ripening and insensitivity to length of day. Those features encourage double cropping, which smooths the flow of food supplies available to farm families during the year. The poor benefit in particular because they have difficulty saving from one harvest to the next or borrowing when a lean harvest occurs.

Drought resistance is another attraction of modern varieties. Because breeders have placed emphasis on improving root structure, some modern varieties withstand dry spells better than traditional varieties. This feature especially helps farmers in regions where irrigation or rainfall is unreliable and who, consequently, usually are poorer than farmers who have more assured sources of water.

Poor farmers, who tend to lack the knowledge and ready cash to use chemicals to combat insects and diseases, have gained from the wide range of genetic resistances that has been bred into modern varieties. The heightened disease and insect resistance of these varieties has lifted average yields without eroding maximum yield potential.

Nevertheless, many of the poorest people are in difficult environments, such as semi-arid zones or in rice-growing regions with unreliable rainfall, and they continue to grow traditional varieties. The modern varieties developed so far have offered insufficient advantage for such conditions. Significant change in these areas is likely to occur only when better varieties of drought-tolerant crops such as millet or



Research & development

The lesson of history is that technological change in agriculture is a driving force for economic growth. Over the ages, new knowledge leading to agricultural innovation has allowed more food to be produced while releasing capital, labor, and, indeed, land for nonfarm pursuits. The expanding output itself is a source of additional rural employment. Rising employment and incomes in turn expand demand for food.

In many of the developing countries that are suffering economic crises, the root cause is inappropriate policies combined with neglect of the research and extension system.

Food supplies. During the past two decades, food production in developing countries has expanded somewhat faster than population, but progress has been uneven. Annual increases in cereal output have ranged from 1.5 percent in Africa to 4.6 percent in China. Increases in production of roots and tubers ranged from 1.0 percent in Latin America to 6.7 percent in India. Increases in grain legumes ranged from nil in China to 2.7 percent in Africa. With population growth slowing, staple food production in aggregate is likely to continue to stay ahead of population, given a continuation of other contributing trends.

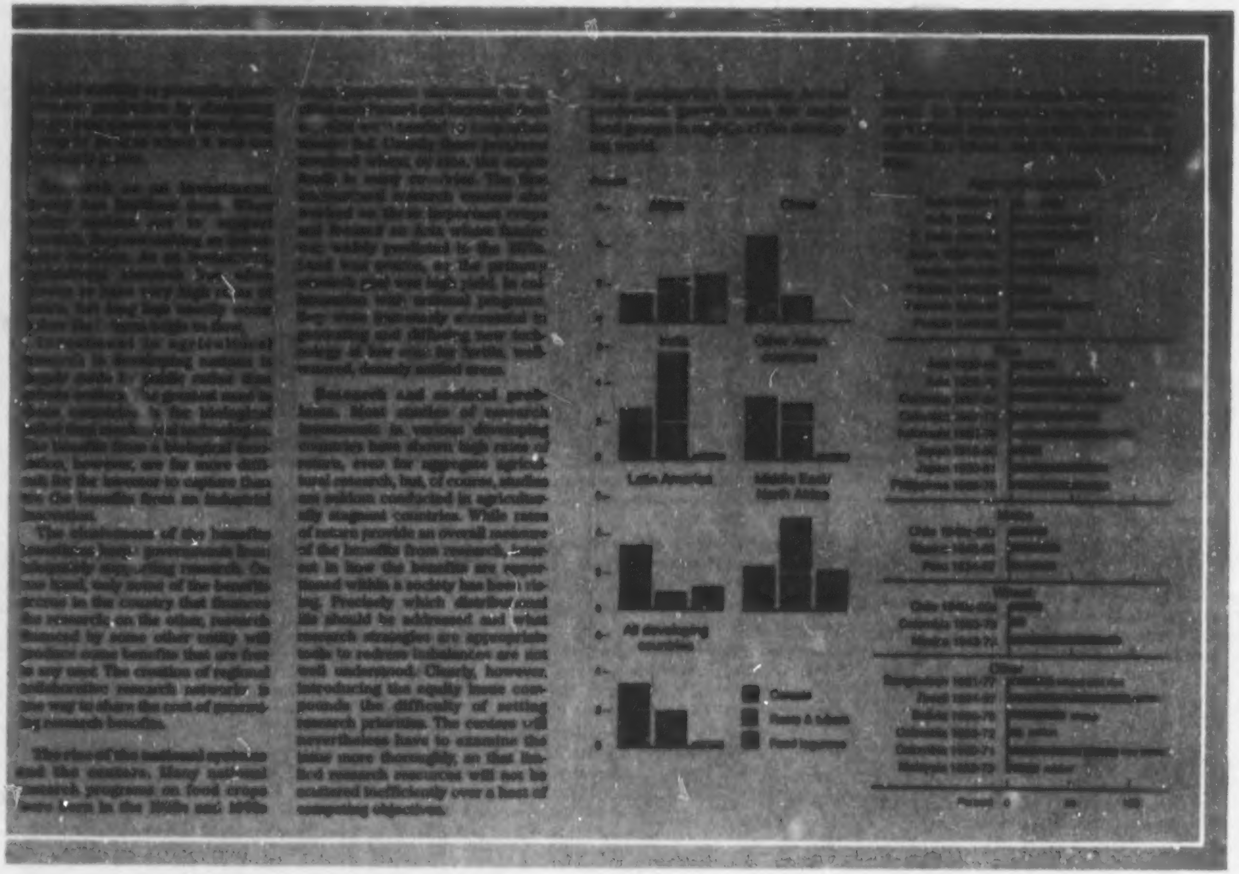
Paradoxically, food imports are also expected to grow. Rapid urbanization and rising incomes in successfully developing countries create a powerful demand for additional food, which historically has exceeded the growth capacity of even the most progressive agricultural sectors. The food imports must, by and large, come from the industrial nations that have surplus capacity.

In fact, despite the growth in agricultural production, fostered in part by increased investment in research, the developing countries as a whole have not become less dependent on imported food. Every region imports more food than it did a decade ago—but some countries have done very well. In the late 1960s, food imports by developing countries were 2.4 percent of domestic production; now they are 10 percent.

The most important force behind these growing imports is, however, rising incomes. People in areas with larger incomes can afford more food and they are willing to pay, even if importing is necessary. So, development progress tends to increase food imports. Unfortunately, in some countries expansion in imports is caused by the inability of production to meet even normal increases in demand.

Productivity. Generally, the developing regions that have achieved the best record in expanding food production during the past 20 years are ones whose farmers have raised their yields. As an indicator of progress, yield per hectare is fairly easy to measure and the data are widely available. But it is not necessarily the appropriate indicator in every situation. Land is not the critical limiting resource for all farmers. Changes in the productivity of labor-short, land-abundant farmers would be better measured by yield per person. Similarly, yield per hectare is not the most suitable indicator of progress for research aimed at improv

Food output: Production of major food groups in developing countries 197[illegible]83.



[illegible] where it was [illegible]

Research as an investment. [illegible] to have very high rates of return, but long lags usually occur before the[y] begin to flow.

[illegible] agricultural research in developing nations is largely made by public rather than private entities. The greatest need in these countries is for biological rather than mechanical technologies. The benefits from a biological innovation, however, are far more difficult for the inventor to capture than are the benefits from an industrial innovation.

The diffuseness of the benefits [illegible] governments from adequately supporting research. On one hand, only some of the benefits accrue in the country that finances the research; on the other, research financed by some other entity will produce some benefits that are free to any user. The creation of regional collaborative research networks is one way to share the cost of generating research benefits.

The rise of the national systems and the centers. Many national research programs on food crops were born in the 1930s and 1940s [illegible] Clearly these programs involved wheat, or rice, the staple foods in many countries. The first international research centers also worked on these important crops and focused on Asia where famine was widely predicted in the 1960s. Land was scarce, so the primary research goal was high yield. In collaboration with national programs, they were extremely successful in generating and diffusing new technology at low cost for fertile, well-watered, densely settled areas.

Research and societal problems. Most studies of research investments in various developing countries have shown high rates of return, even for aggregate agricultural research, but, of course, studies are seldom conducted in agriculturally stagnant countries. While rates of return provide an overall measure of the benefits from research, interest in how the benefits are apportioned within a society has been rising. Precisely which distributional ills should be addressed and what research strategies are appropriate tools to redress imbalances are not well understood. Clearly, however, introducing the equity issue compounds the difficulty of setting research priorities. The centers will nevertheless have to examine the issue more thoroughly, so that limited research resources will not be scattered inefficiently over a host of competing objectives.

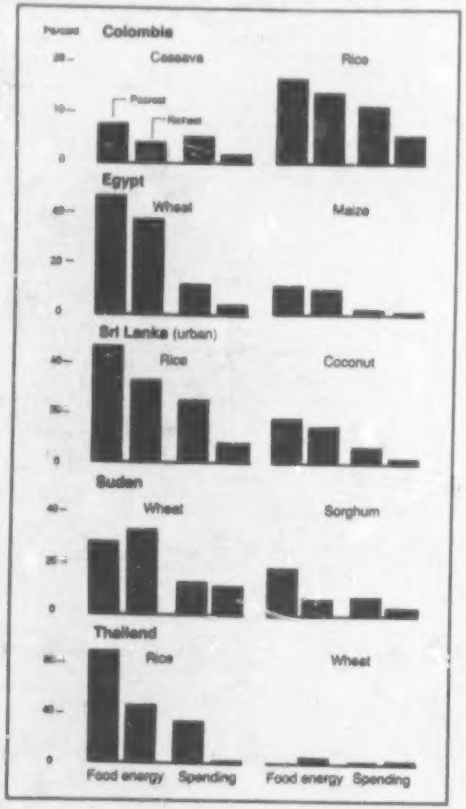
[illegible] growth rates for major food groups in regions of the developing world.

Percent
Africa
China
India
Other Asian countries
Latin America
Middle East/ North Africa
All developing countries
Cereals
Roots & tubers
Food legumes

[illegible]

Rice
Japan
Japan
Philippines
Maize
Chile 1940s-60s
Mexico
Peru
Wheat
Chile 1940s-60s
Colombia
Mexico
Other
Bangladesh
Brazil
Bolivia
Colombia
Colombia
Malaysia
Percent 0
50
100

Staple foods and the poor: Compared with the richest 10 percent of the population, the poorest 10 percent get a larger share of their food energy from staple foods and devote a larger share of their food expenditures to staples.



sorghum become available or when techniques that raise water-use efficiency, such as micro-irrigation, can be used to support modern varieties of the less drought-tolerant crops.

Farm size and adoption. There is no general association between farm size and the adoption of modern varieties—at least of rice and wheat. In some areas, a higher proportion of large-scale farmers adopt, while in others, a higher proportion of small-scale farmers adopt.

In areas where modern varieties have taken hold, the first adopters usually have been the growers with larger farms, but those with smaller farms have soon caught up. Early adopters capture some extra benefit by increasing their output before general output expansion pushes prices down. Smaller farmers sometimes lag in adoption because they wait until a better-off neighbor has proved the new varieties or because they cannot get scarce inputs at first. But once smaller farmers adopt, their ability to mobilize more family labor per hectare often gives them higher yields.

The sharpest contrast between adopters and nonadopters is not rooted in farm size or tenure, but rather in regional differences in natural resources. This is dramatically shown in India. In some regions, a substantial proportion of all farmers have adopted modern varieties. But in others that lack irrigation and have poor soils, few with any size of holding have adopted. These areas tend to have concentrations of the poorest people. Resources are distributed fairly evenly in such regions, thus, should suitable technologies be introduced, the benefits could be rather equitably shared.

Employment. Modern varieties expand demand for labor, particularly at harvest when more people are needed to reap and thresh the higher yields. Wages, however, do not tend to rise because the supply of laborers is large, mobile and growing. Nevertheless, the modern varieties provide jobs and income for innumerable people who would otherwise go without.

The increased output possible with modern varieties has a less pronounced effect on demand for land, but, because of the restricted supply of land, rents and land values rise.

Nutrition. The effect of modern varieties in stabilizing food prices has been especially beneficial to the very poor, as demonstrated by research studies at IFPRI and other centers. In low-income countries, the poorest 20 percent of the population spend 60 to 80 percent of their income on food. When population growth and rising incomes in other parts of the economy raise demand and food prices, the poor suffer. The greatest gains for the poor have come when modern varieties have increased production of foods on which they spend a high proportion of their income. Because food expenditures consume such a large part of the income of the poor, a reduction in the price of a food improves their real incomes relatively more than it does the incomes of the wealthy.

The spread of modern varieties has helped to increase availability of food energy, the principal nutritional deficiency of the poor, and has prevented starvation of millions in Asia. Since protein in diets is mostly unavailable until the body's food energy requirements are met, research directed toward increasing the quality or quantity of protein rarely contributes to significantly better diets for the poor, except where legumes are unimportant and root crops or bananas are the staple foods.

Expanding scientific and technical capability

Training was part of the charters of the first centers. From their inception, IRRI and CIMMYT trained scientists in research techniques. They also provided facilities for conducting research as part of master's and doctoral degree work.

All centers regard upgrading the capabilities of scientists and technicians of national research programs as vital to their mission. Beyond the continuing innovations of their farmers, nations that are weak scientifically cannot effectively develop their own technology or improve imported technology.

Between 1959 and 1980, the number of agricultural researchers in developing countries rose from 14,700 to 63,000. During that period, over 16,000 of them participated in the various types of training provided by the centers.

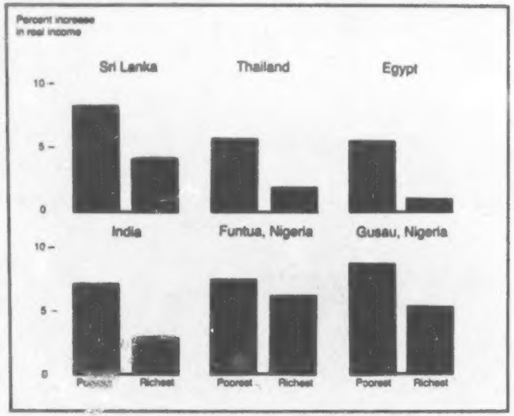
Over 12,000 have been in formal group training courses. Such courses last from one week to several months. Some are production courses covering a whole crop season to permit participants to take part in the full spectrum of production tasks. With rising frequency, the centers are collaborating with national agencies in conducting formal training programs locally.

About 400 candidates for doctoral degrees and 800 candidates for master's degrees—most of them men—have done their thesis research under the supervision of centers' staff members. Usually this work takes 2 to 3 years. Some of these graduate students attend a university near the center, but many are students from developing countries enrolled at universities in industrial nations. For the latter, thesis research at a center is likely to be more pertinent to conditions at home than research they might otherwise do at their university.

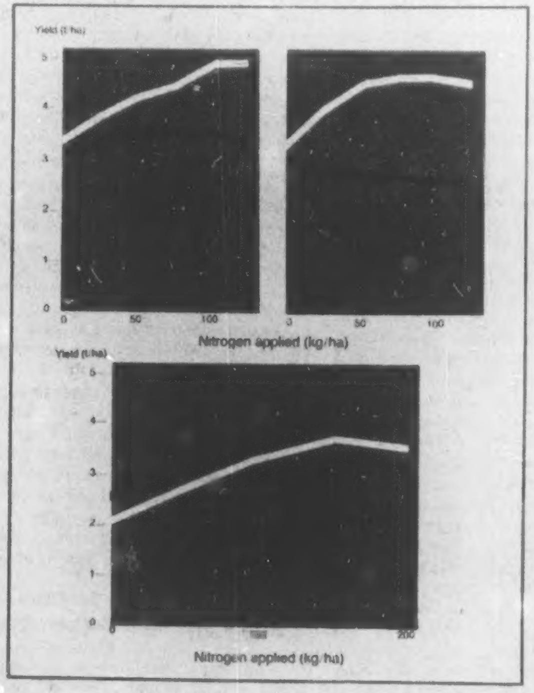
Special training programs have been set up for about 2300 individuals from developing countries. These are people who come to a center by prearrangement to learn a technique or to cover a specially organized series of topics. In addition, over 450 researchers from developing countries have held post-doctoral appointments at the centers. In these posts, the researcher learns new techniques and conducts research, which is beneficial to both the researcher's home country and the center's research program.

The willingness of administrators in developing countries to release scarce personnel for substantial periods and to assure them of positions on their return demonstrates the high regard that they have for the training provided by the centers. Many former participants, who have been interviewed, speak not only of gaining knowledge and technical skills, but of personal growth in dedication to both physical and intellectual work, motivation, determination, purpose, and confidence. For many individuals who were educated in systems that stress theoretical knowledge, the centers' training in the field or laboratory instills practical competence and understanding.

Food prices and the poor: A 10 percent drop in food prices raises the real income of poorest 10 percent of the population more than that of the richest 10 percent.



Yields with and without fertilizers: Modern varieties give slightly higher yields than traditional even without fertilizer and give a much higher response to fertilizer application (30 experiments with rice in the Philippines, 18 experiments with rice in India, 25 experiments with sorghum in India).



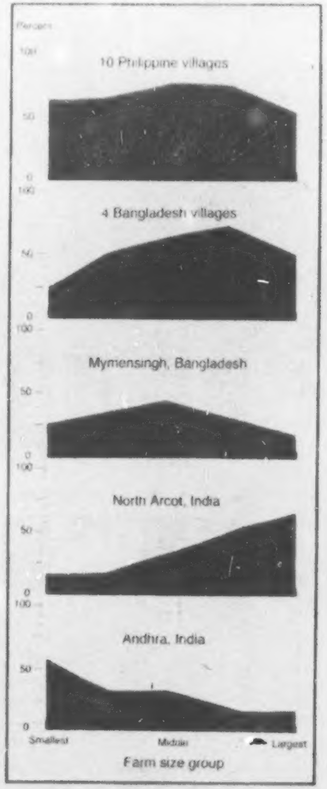
Former trainees who work in national programs are also important for the centers as cooperators in research and dissemination. Naturally they are often sought out by visiting center researchers. They may be invited back to the center to participate in workshops and to help in the training of others. These contacts are valuable for the national program as well. They help offset the sense of professional isolation and the risk of obsolescence that is difficult for researchers to avoid in nations that have small scientific establishments.

Developing nations' perceptions of their training needs are shifting as their development evolves. Demand for postgraduate training is growing, but the centers scarcely have the capacity to meet those needs. Developing nations' interest in group training within their own borders is also increasing. Such courses are jointly taught by centers' staff and, usually, former trainees. Such training is particularly suited to production courses, allowing the centers to devote their headquarters' facilities to research-related training activities.

Stronger research institutions

The centers and national research programs reinforce each other's work. The reputations of the centers have added credibility to the work of the national scientists associated with them. Collaboration with the centers has raised the productivity of national research and helped to convince governments and donor agencies that there are high returns to investment in research. But countries that lack

Farm size and adopters of modern varieties: Proportion of farmers in different farm size groups who grow modern rice varieties.



researchers to do adaptive research, and effective extension workers to spread new ideas, gain less from the centers.

The centers have helped to stimulate nations to increase research output by improving organizational structure, by instituting better research management techniques, by making advances in research methods, and by shifting priorities toward food crops. The centers have also helped developing nations increase their contacts with scientists worldwide through database services, international meetings, and publications.

Many national programs have adopted the centers' procedures for making massive numbers of crosses and exposing them to intense attack by insects and diseases to identify the most hardy lines. Some techniques have also been developed collaboratively. An example is the procedure for mass-producing inoculum of downy mildew, a devastating disease of maize, developed by research workers in the Philippines and Thailand, in collaboration with CIMMYT.

Some national research programs have made immense progress during the past 20 years, but others remain weak. In Asia, the long-term support that research has received has been amply repaid through the growth of the region's food production. In Africa, there has been less payoff, in part because investment in research started later, and the base of commodity-specific knowledge was generally lower.

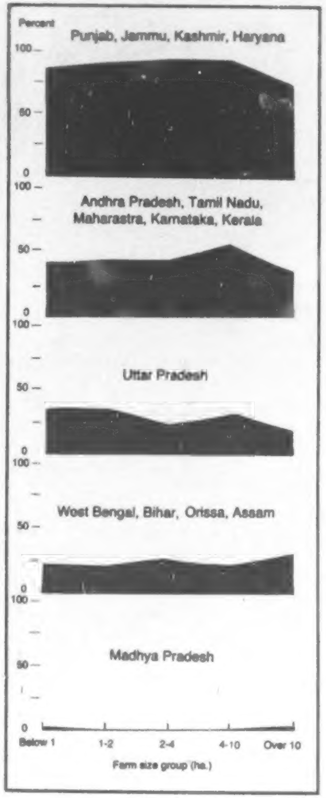
Influence on priorities. The research priorities that the centers set, their direct efforts to strengthen national institutions, and the regular services that they provide, all have some effect on the directions taken in national research. Before the 1960s, few developing countries spent much for research on their staple food crops. That changed after the centers were created. In Bangladesh, for example, investment in rice research went from being a fraction of the amount in jute research in the 1960s to being four times as much by 1980. Before the advent of ICARDA with its emphasis on field crops, less than half of Syria's research projects involved field crops. By 1984 about 75 percent of the national research projects were on field crops. Before CIAT and IITA began cassava research, only India had a national cassava program. Now two dozen nations have one.

Occasionally, the reaction to the centers' priorities is inordinate. Sometimes the portion of national research resources devoted to an area that the centers work in has been disproportionate to the possible contribution of that area to output. On the other hand, occasionally, a national research system will shift support away from an area that is well-covered by a center. But these instances are rare and not necessarily irrational.

Perhaps the most important influence of the centers on the national programs has been rising emphasis on research directly aimed at solving farmers' problems. Since research workers at the centers tend to have high prestige and to serve as role models, their demonstrated interest in field work and on-farm trials, along with the stress given by centers' training programs, has been emulated in many national programs.

The centers have also set an example by demonstrating the productivity of problem-oriented, multidisciplinary research.

Farm size and adoption of modern varieties: Proportion of rice area planted to modern varieties in relation to size of farm (all locations are in India).

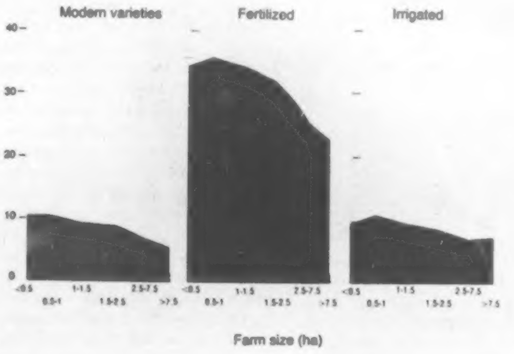


In Brazil, for instance, the national research structure was reorganized into multidisciplinary commodity institutes along the lines of the international centers.

Direct assistance. Aside from providing germplasm and training, the centers assist national research programs with ideas for methods, techniques, and research management. Direct help in strengthening the organization and structure of national agricultural research systems is the mandate of ISNAR. In addition, it provides some training in research management.

Another example of direct help is the analytical service that ILCA provides to national agencies that have large databases on animal production. National researchers get assistance from ILCA staff in analyzing the data, and the results are sometimes used in designing projects for funding by donors.

Farm size and modern technology in Bangladesh: Proportion of area planted to modern rice varieties, fertilized, and irrigated, by farm size.



Research networks promoted by the centers have encouraged countries to expand their research capacity and to cooperate in sharing research results. Networks that test biological materials have accelerated the development of new varieties through international multilocation testing. Data on a breeding line tested at many locations in one year can be a partial substitute for tests on a line at one location over several years. Multilocation testing also provides readings on the response to certain types of stresses that could not easily be determined otherwise.

Sound policies

Need for food policy research. For the past two decades, in years of bad harvests as well as good, the global supply of food energy has exceeded the world's nutritional requirements by a substantial margin. Nevertheless many millions of people remain ill fed. The gains in total food production are unevenly distributed from country to country, from region to region within countries, and among households within regions.

Those inequities are in part the result of policy decisions, both national and international, that affect the onset and impact of technological change. Attempts to influence the level of food production and consumption require attention to the economic, political, and institutional setting as well as to technological questions. Consequently, research that deepens understanding of the nature and role of domestic and international policy and thus leads to better decisions is an important element of global agricultural research.

In its broadest sense, agricultural and food policy embraces the collective efforts of national and international agencies to alter the environment of producers, consumers, and traders. Food policy analysis is concerned with such issues as food production, consumption and nutrition, the generation and diffusion of new technology, the enhancement of physical and human stocks of capital, the distribution and pricing of food, and the role of trade and international policies.

IFPRI is fully devoted to food policy research; ILCA has recently formed a livestock policy research unit; and several of the other centers in the CGIAR system undertake food policy research, generally on a modest scale. At some centers, social science research of policy relevance is conducted within a department of economics or social science, but it is often linked with farming systems research. At one center, it is incorporated into the work of multidisciplinary commodity teams. The focus of this work at the centers is on policies to enhance the generation and diffusion of new agricultural technology. Outside of IFPRI and ILCA, there is little research in the center system that is directed specifically at food and agricultural policy.

The individual centers must stay abreast of the policy environment in countries where they have working relationships with the scientific community.

This type of monitoring enables a center to allocate its own resources better and, at the same time, to discuss policy questions with national authorities on the basis of current conditions.

Through collaboration with national scientists in the development of new technology, both economists and biologists from the centers have had access to national policy makers. The introduction of significant technological change causes disequilibria that compel action from policy makers.

When they recognize the magnitude of the potential gains from the new technology and understand the distribution of the costs and benefits, policy makers become acutely aware of the burden imposed by shortages of inputs, inadequacies of transport and processing facilities, subsidized food imports, and similar problems. Thus, while most of the centers focus on generation of new technology, they are quite legitimately involved in policy discussions.

Effects of policy work. Any credit that the centers could claim for constructive policy changes made by national leaders would be empirically difficult to support. It is evident, however, that such work as IFPRI's research on input policies, food security, crop insurance, and food subsidies; CIMMYT's policy seminars; and IRRI's research on the consequences of new technology has contributed to a more informed debate and has been in demand from policy makers.

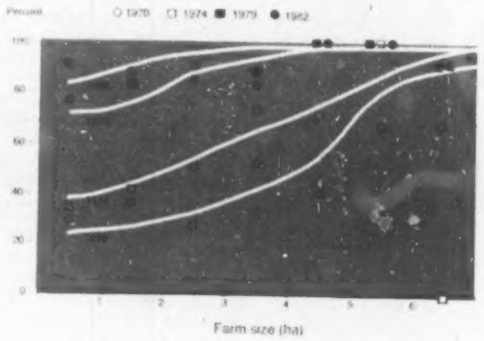
IFPRI is the central institution in the research on agricultural and food policies. Together with the commodity oriented centers, it gives the CGIAR system the capacity to review both the on-farm constraints and the policy constraints to greater food production and improved welfare. The joint application of this capacity is illustrated by the IFPRI-IRRI research on irrigation in the Philippines, which contributed to the Asian Development Bank's decision to reconsider its plans to curtail investment in Philippine irrigation schemes.

Another example is Egypt, which spends $2 billion a year on food subsidies. Analyses made in collaboration with IFPRI showed that the country could save hundreds of millions of dollars annually without jeopardizing the food security of the poor.

The contribution of policy analysis lies in its direct effects on policy, and, as well, in the credibility it gives policy analysis in national agencies. Many governments neglected this area in the past. The efforts of the centers, and of IFPRI in particular, have demonstrated that providing policy makers with better information about strategic alternatives can lead to broad and significant gains. And policy makers, for their part, have become further convinced of the value of building domestic capacity for research on policy issues.

Food policy research has been internally beneficial to the centers, too. Support for assigning secondary priority to breeding for higher protein content came from research policy studies that showed that better protein nutrition could be achieved more economically by focusing on high yielding and widely adapted varieties.

Adoption of rice varieties on small and large farms: Surveys in the Central Luzon area of the Philippines show the tendency of small farms to catch up to large farms in adoption of modern rice varieties.



Relations with the centers: The national viewpoint

Case studies completed in 25 countries, which included interviews with usually 40 to 50 persons in each country, have provided a basis for assessing the opinions of researchers and others in national programs about the staff and activities of the international centers.

Contacts. Most national scientists who collaborate with the centers hold a favorable view of the quality of their professional association with scientists from the centers. They consider their sustained relationships with centers' scientists to be an important ingredient of successful collaborative research and they contrast the continuity of those relations with the abrupt changes in personnel and support that often occur in bilateral projects every few years. National scientists have occasionally felt that some centers' researchers were overbearing or unqualified, but the instances have been isolated and generally seem to have passed as collaborative relations between national programs and the centers have matured.

Each center has focused its contacts on researchers who work with commodities or problems that the center regards as important. In the early years of the CGIAR system, that meant that researchers in some countries were bypassed. But as more centers have been created nearly all developing countries now have some professionals in touch with one or more of the centers. Observers in several countries have said, however, that researchers on university faculties tend to be overlooked by the centers.

Favored services. National scientists regard the channels for exchange of germplasm established by the centers as a unique service. Overall, they consider the workshops, conferences, training programs, newsletters, and publications of the centers to be more valuable than those available from most other sources. Research networks are appreciated particularly by scientists in countries that have small research establishments. Such networks allow several countries to specialize on different aspects of a common problem and to exchange results for common benefit. In addition, participation in a network raises the professional status and motivation of national researchers.

Coverage. Whether the centers are addressing the right research topics tends to be viewed differently in countries where centers are located than in countries without centers. Scientists in countries that have a center headquarters often feel that the center's global or regional outlook diverts attention from their country's special problems. When a center's researchers are outposted to another country, their interests are seen to be more in consonance with those of the indigenous scientists.

The centers, many of which were created to help increase food production, are not surprisingly believed to have had a salutory effect on the work of researchers who likewise work on food production. The development of national programs on neglected crops like cassava was, national researchers say, due largely to the efforts of the centers.

National researchers see some gaps in the coverage of the centers. They point out that many poor farmers cultivate fiber crops such as cotton, jute, and kenaf, oil crops such as copra and palm oil, and beverage crops such as coffee, tea, and cocoa, none of which are handled by the international centers. While research on industrial and export crops might be primarily beneficial to plantations, it would also help the small-scale producers who rely on them and, particularly for tree crops, contribute to stabilizing land and providing income in vulnerable environments.

Genetic materials. From the vantage point of national programs, among the most important contributions of the centers is the provision of genetic materials. Seeds and clones bearing a profusion of useful characters give national plant breeders more choices. And that improves their odds of producing and identifying lines that have the features necessary for good results in farmers' fields.

Some international nurseries, such as the U.S. Department of Agriculture wheat rust nurseries, were in operation before the centers were founded, but the nurseries coordinated by the centers are accessible to far more countries and facilitate the routine distribution of useful germplasm. Small-scale breeders no longer have to describe their needs to solicit seed from breeders who have large crossing programs. Instead they receive a steady flow of material with tested resistance to diseases, pests, and adverse conditions. The centers deliberately include a diverse selection of strains in most nurseries to ensure that something will be of interest in nearly every ecological niche.

International exchange of vegetatively propagated crops was almost nonexistent prior to the start of the cassava programs of CIAT and IITA and the potato program of CIP. In food legumes, the exchange of germplasm was sporadic and informal before the centers began international testing programs for such crops as field beans, cowpeas, chickpeas, and pigeonpeas.

Aside from making superior genes widely available, the international nurseries have broadened the horizons of breeders. The nurseries allow breeders to compare, in their own test plots, the yield performance of hundreds of lines from abroad. In cassava, for example, this experience has led breeders to see 40 tons per hectare as an achievable target where they once thought 20 tons per hectare was excellent.

Breeding techniques. The centers have been vigorous in passing on research techniques. Since plant breeding is in many respects a "numbers game," the ability to make many crosses and selections efficiently is a significant determinant of a program's output. The centers have trained numerous persons in the physical skills of making crosses and monitoring test plots. The vacuum emasculation techniques promoted by IRRI has boosted the productivity of rice breeders in many countries. The spread of techniques for mass rearing insects and for collecting and inoculating disease pathogens has enabled breeders to screen lines for resistance on a much larger scale.

The interaction with centers has also encouraged breeding programs in a number of countries to take an interdisciplinary approach. Instead of the breeder being limited to breeding and the entomologist and pathologist being confined to resistance evaluation, they collaborate in planning crosses and selecting materials for multiple resistance.

Farming systems research. The effect of the centers' emphasis on farming systems research on national programs has been uneven. Although many countries have begun farming systems research programs, not the least because of the urging of donors and the help of the centers, the impact has been more significant when national programs have managed to integrate the concept of farming systems in the research structure and less perceptible when the program has simply been added alongside existing commodity programs. The flow of information back to researchers about on-farm problems has been useful within both national programs and the centers.

Training. Many national researchers rate training by the centers as equal in importance to the provision of germplasm. Participants appreciate the knowledge acquired, as well as the opportunity to mix with colleagues in other countries. The contacts often lead to the formation of networks and continuing professional correspondence. Training courses brought from a center and mounted locally have been found particularly useful by national programs.

Perceptions of the centers' training programs can differ among countries and even among institutions within a country. Some countries with large numbers of highly trained researchers have only limited interest in the courses that the centers offer. There are instances, too, where researchers at a large, relatively well-

National agricultural research systems

[illegible]

In Latin America, overall, research systems grew rapidly [illegible] Asia, and research expenditure in some countries declined during the 1970s. There was thus a period of reorganization in several countries.

In Africa, aggregate growth in research expenditure was high but there was considerable variability by country. Many African research systems were disrupted by larger national problems after independence. Some research systems suffered radical changes, while some others remained highly dependent on, or under the control of, foreign researchers.

Political pressure by consumers for reliable food supplies was one of the basic reasons for the growth of agricultural research expenditures, particularly in Asia in the 1960s and in Africa in the late 1970s and 1980s. The urban sector also wanted more foreign exchange for importing industrial and consumer goods, which [illegible] agricultural [illegible]. These groups lobbied governments to invest in agriculture in order to provide adequate food and to maintain economic and social stability.

During the 1960s, it became increasingly clear that agricultural research was a powerful instrument for increasing output. The rates of return to agricultural research in Asia and Latin America were high. The impression made by the green revolution changed perceptions in developing countries and among development agencies about what research could do. Since many countries in Asia and Latin America no longer had cheap land to exploit for increasing production, they increased investment in research as one answer to the demands for more agricultural production.

Weaknesses remain in many national systems. Educating and retaining enough researchers to conduct meaningful research is a chronic problem. Moreover, many research programs are not well enough organized to make efficient use of the resources they have. Some significant commodities continue to be neglected. The international research centers have helped national programs, by example and through advice, to overcome these difficulties.

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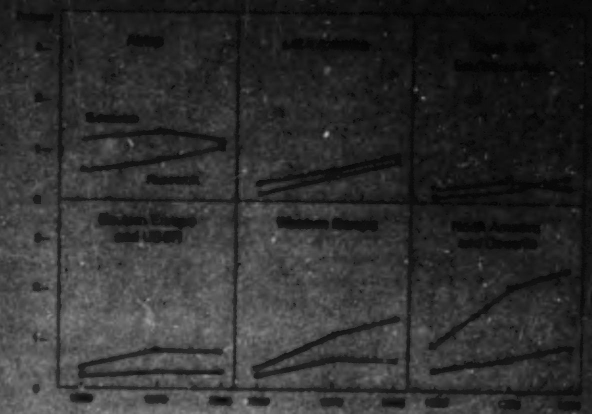
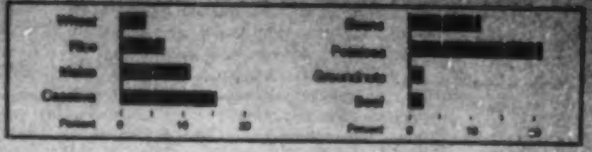


Spending by [illegible] as a share of agricultural research expenditures in developing countries.

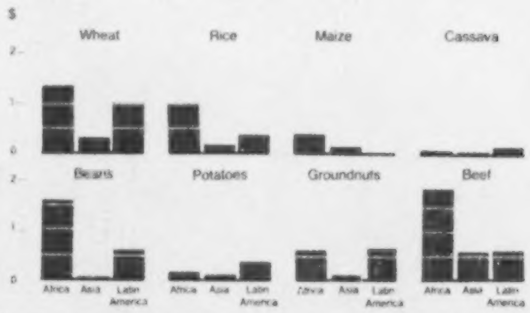


Small research programs: Indicators of the scope of national research programs in small countries.

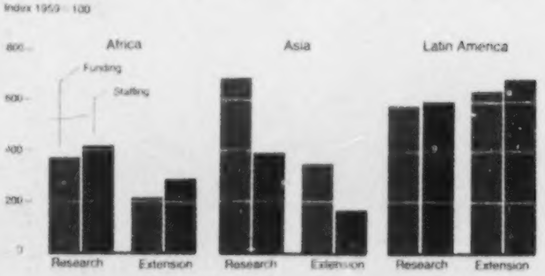
Country	Crop area million ha	Agricultural researchers number	Agricultural researchers number per million ha	Research expenditures $/100 ha
Countries with under 50 researchers				
Cape Verde	0.04	6	150	n.a.
Tonga	0.05	8	151	540
Solomon Islands	0.05	8	154	640
Mauritania	0.20	9	46	435
Lesotho	0.29	13	45	96
Gambia	0.27	13	48	28
Benin	1.80	21	12	96
Barbados	0.03	23	697	1518
Fiji	0.24	23	93	650
Somalia	1.07	26	26	45
Burundi	0.98	28	29	68
Guyana	0.38	35	92	417
Haiti	0.89	37	42	27
Chad	3.15	40	13	31
Malawi	1.31	41	31	181
Jamaica	0.27	41	151	191
Trinidad & Tobago	0.16	43	272	265
Liberia	0.37	45	121	185
Mali	2.05	47	28	182
Togo	1.42	49	35	87
Countries with under 25 researchers/million hectares				
Uganda	5.7	58	10	85
Ethiopia	13.9	145	11	21
Zaire	6.3	97	15	53
Nigeria	30.4	491	16	262
Niger	3.6	59	18	35
Zambia	5.1	96	19	21
Senegal	5.2	105	20	122
Sudan	12.4	272	22	77
Cameroon	6.9	156	23	48
Comparative regions				
India	169.1	2345	14	73
N. America & Oceania	280.5	13607	49	6190
Brazil	7.1	2935	41	244
W. Europe	95.0	19540	206	1570

Research intensity: Research spending by commodity in relation to the value of the commodity ($ per $100 of commodity value; 1972-79).

Africa: Ghana, Kenya, Nigeria, Sudan, Tanzania, Tunisia, Uganda, Egypt. *Asia:* India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, Turkey. *Latin America:* Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela.



Growth in research and extension: Changes in funding and staffing of research and extension programs (data for 1980 as a multiple of 1959).



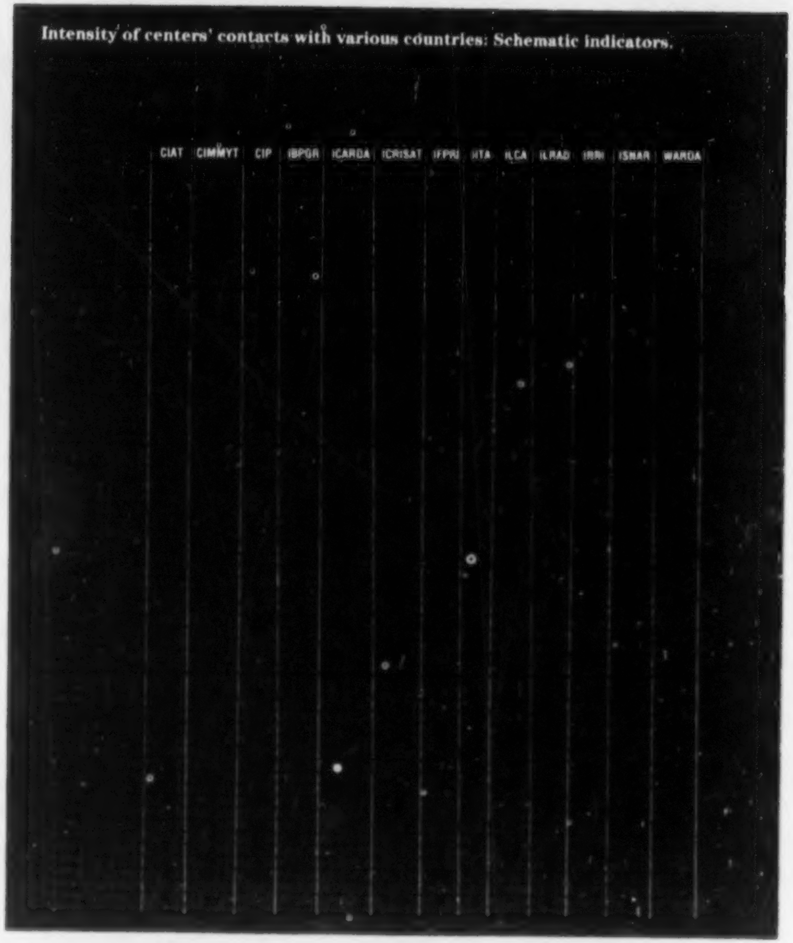
funded national institution rate germplasm as being a more important contribution than training, while researchers at smaller institutions in the country see training, especially with the centers, as their major need.

Many national researchers would like the centers to offer more post-graduate scholarships and post-doctoral positions as well as more opportunities for students who are studying in industrial countries to do their thesis research at a center.

Publications. National scientists are eager to receive centers' publications, particularly the more technical ones giving details of research methods and findings. Shortage of funds, however, limits the ability of researchers to purchase all the materials they want. In particular, research workers distant from the main national research site lack the access that they desire to centers' technical publications.

Network newsletters that give individuals the opportunity to share information about their activities provide a sense of involvement to participants and boost enthusiasm for programmatic work. Researchers interviewed consistently ranked newsletters from the centers highly, indicating the value of the research information they contain.

Selective dissemination of information by various centers makes world literature accessible at low cost to researchers with whom they are in contact. The centers supply extensive bibliographies of current literature to researchers and some also provide abstracts and reprints of articles.



Intensity of centers' contacts with various countries: Schematic indicators.

	CIAT	CIMMYT	CIP	IBPGR	ICARDA	ICRISAT	IFPRI	IITA	ILCA	ILRAD	IRRI	ISNAR	WARDA

Influence on research investment. National researchers generally credit rising public awareness of the effects of the green revolution as having contributed to increased investment in agricultural research. Also, the existence of collaborative work with the centers sometimes is helpful in protecting national research budgets from cuts or in attracting more funds from the government.

Institutional organization and policy making. Although many research programs have undergone significant reorganization in recent years, the changes are not often attributed to the advice or example of the centers. Nonetheless the widespread adoption of the centers' style of research—a multidisciplinary, problem-oriented commodity approach—is evident. The aid of ISNAR, which is concerned with the broad issues of institutional development, has been welcomed by most countries that have received it and is sought by many others. The Dominican Republic, Kenya, Fiji, Malagasy, and Rwanda, for example, have actively implemented jointly formulated plans, while other countries have used the occasion of an ISNAR review as an opportunity for taking a fresh look at their own planning problems.

Policy issues can be highly sensitive, nevertheless many individuals involved in policy formulation indicated that they appreciate IFPRI's collaboration. They feel that their own analysis gains credibility if it is accompanied by an IFPRI analysis. IFPRI is widely regarded as a dispassionate source of independent and professional thinking on topics that are inevitably delicate.

Some important activities and issues

The impact of the centers depends largely on how effectively they and the national programs carry out their research, and on how effectively it is put into use. Some issues that relate to important research activities of the centers and their potential for future impact have been singled out for closer examination.

Plant germplasm and breeding

Global activities in the center system. Plant breeding, which leads to new varieties and improved human well-being, aims at combining useful genetic characteristics from different parents. The sources of such characteristics are farmers' varieties and wild relatives of the crops. Systematic efforts to collect and use a wide range of germplasm have long been under way. While the centers were latecomers to the field, they now lead the work in many food crops.

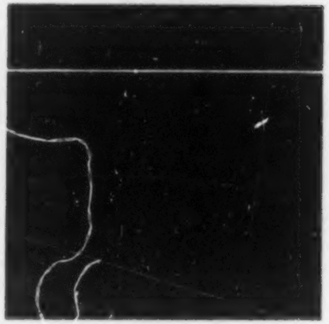
The activities of IBPGR have raised public awareness that the genetic variation stored in cultivated crops and their wild relatives is a vital natural resource. Paradoxically, though genetic variation is the basis for plant breeding programs, the effects of successful programs are antagonistic to it. The creation of highly productive, uniform varieties is an efficient way to achieve rapid agricultural progress. To do so, breeders commonly establish restricted gene pools that satisfy many of the basic requirements and then introduce new characters as needed. Genetic resources are primarily seen as a source of identifiable characters and only rarely as a source of increased overall variation.

IBPGR encourages the conservation, documentation, evaluation, and utilization of genetic resources, largely in and by national programs, with the cooperation of the CGIAR centers and other agencies. The priorities of IBPGR are based on risk of genetic erosion, economic and social importance, plant breeders' requirements, and size and scope of existing collections. It has promoted the development of networks of base collections and of national genebanks, and does not itself build or operate genebanks.

Collections in genebanks fall into two categories. A base collection is one that can be kept relatively undisturbed in long-term storage. An active collection, in contrast, is one used for regeneration, multiplication, exchange, evaluation, and documentation. Base collections must be closely associated with an active collection because base collections are not usually used for germplasm exchange. These distinctions are not widely understood and have led to unwarranted charges of restrictions on free flow of germplasm.

IBPGR has helped to organize 300 collecting missions in 88 countries. Seeds of 138 species collected during these missions have been placed in genebanks of 450 organizations in 90 countries. Collection in recent years has brought genebanks a good representation of the natural genetic diversity in many of the plant species that centers work on. But wheat, barley, certain millets, and tropical pasture species are underrepresented. In addition, little collection of wild species of sorghum, millet, cassava, chickpeas, pigeonpeas, and cowpeas has been done.

Germplasm collections: IBPGR's 1984 estimate of the number of accessions of major food crops held in genebanks and the comprehensiveness of the collections in relation to the variability existing in nature.



Centers' breeding approaches. The development of modern, widely adapted wheat and rice varieties constitutes a model that breeders of other crops have had difficulty following. Widely adapted varieties are only likely to appear in relation to uniform environments. For physically or socially diverse environments, more closely tailored varieties may have to be produced.

Plant breeding at the centers has been rather centralized and largely conducted on experiment stations under good conditions, with few centers systematically attempting to simulate typical farm conditions through low-input trials. The products of breeding are subjected to multilocation testing by the centers as well as by collaborating programs. The materials in multilocation trials are freely available to any breeder for use as a parent in crosses or for release as a variety.

Despite the large scale and high caliber of the centers' breeding programs, several criticisms can be made. Centralized decisions about parents and breeding plans are bound to be less than optimal for most places, most of the time, because environments are diverse and performance is determined by the interaction of genotype with environment. In the area of resistance breeding, perhaps too much reliance is placed on major gene resistance and not enough attention is paid to building horizontal resistance (known also as multiple-gene or durable resistance), which may be less dramatic, but is more stable. And, attempts to breed varieties for small-scale farmers who use low levels of inputs are likely to be self defeating if selections are made under high-input conditions on experiment stations. Most centers are overcoming these limitations through interaction of breeding programs with the on-farm research activities of national programs and their own farming systems programs.

Farming systems research

Farming systems research employs a systems approach to apply knowledge from the natural and social sciences in order to overcome agricultural problems. Although it is an approach that has long been used by insightful researchers and is not a new, independent science, farming systems research has only in the past decade been recognized by research agencies in a way that brought it specific budget appropriations and designated program activities, so that its methods could be transferred. Consequently, not much of its potential for enhancing agricultural productivity has yet been realized.

Most of the centers have embraced the approach, and as it spreads, its concepts, terminology, and methods are evolving rapidly. There is, however, general agreement about the framework of methods.

Farming systems research examines the farm as a system in which the farmer and farm household are the principal decision unit. The approach is interdisciplinary. It includes activities both at experiment stations and on farms, and is oriented to an area or set of farmers called a target domain, delineated by broadly common soil and climatic conditions or by the relative homogeneity of the principal farming systems. The domain chosen should be narrow enough to make tangible results likely in a reasonable time, but broad enough to spread the research costs.

Since climate and weather conditions determine the likelihood of damage from many pathogens and pests, a subdivision into homogeneous soil-climate regions makes it possible to develop specific management recommendations against them. To provide more specific responses to questions about environments, several centers have entered basic environmental data for thousands of sites into computer storage, which is accessible through a geographical database-management system.

Surveys of farmers' practices, often informal but controlled, are conducted within the target domain by a multidisciplinary team. Matching genetic materials, management, and improvement methods with environments is a continuing activity of researchers. The crucial stage of farming systems research is the development and testing of possible system changes through experiment station trials and on-farm testing, either researcher-managed or farmer-managed. Extension workers are generally involved in the on-farm testing and should join the farming systems research team in monitoring the spread of new technology.

Information from on-farm trials returns to the researchers to be used in progressive redesign of improved practices until they are well adapted to the needs and circumstances of farmers in the target domain. The information, moreover, helps researchers to redirect their priorities to topics of greatest importance to farmers, and, indeed, facilitates their learning from farmers.

Because of the inherent location-specificity of farming systems research, it should logically be implemented by national research programs. But the national programs look to the centers for guidance and help in the development of the approach and its implementation.

The centers' farming systems research has largely focused on refining research methods and supporting national programs by, for example, providing technical assistance, training researchers, developing prospective technologies, and establishing farming systems research networks. For the centers, a direct benefit of the farming systems work is that it increases the contacts between research workers and small-scale farmers.

Plant protection

The centers have significantly influenced the attention that national programs have given to crop protection through the dissemination of high quality information and through the establishment of global nurseries for testing lines and varieties under a broad range of conditions.

Resistance breeding. Resistance breeding has been the keystone of the centers' work in plant protection. From the start, modern wheats were bred for resistance to the rusts that are the most serious diseases of wheat. Many of the resistance genes from those early lines are carried by today's modern varieties and continue to be effective. Although IR8 and IR5, the first two rice varieties from IRRI, did not have high levels of resistance to major pests, the third variety, IR20, was resistant to one of the most damaging insect-virus complexes, and all the varieties that followed carried resistance to an increasingly broad range of insects and diseases.

Plant protection for other crops has also centered on incorporating genetic resistance into materials suitable for farmers. Since rate of release and adoption of new varieties of these crops does not equal that of wheat and rice, the impact has been correspondingly smaller.

It is sometimes claimed that the widespread planting of modern wheat and rice varieties has caused boom and bust cycles, but there is no reliable evidence to support that idea. Pests and diseases that have recently been newsworthy were serious problems before modern varieties existed. Unusual disease or insect outbreaks are more likely to be related to marked changes in agricultural practices, such as a switch to double cropping or the introduction of pumps that permit cultivation during the dry season, than a direct consequence of planting improved varieties.

Control measures. The centers' work with chemicals has been criticized from several sides. On one hand, they have been reproached for developing varieties that are input responsive, because that encourages farmers to increase profits by applying fertilizers, insecticides, and herbicides. On the other hand, some critics charge that the centers have avoided research on chemical control of crop pests.

There are indications that integrated control strategies, pest surveillance, surveys, and monitoring techniques developed by centers' researchers and national programs are being used by some farmers. But because at most centers the leadership of interdisciplinary teams is in plant breeding, genetic resistance is often emphasized at the expense of other pest protection strategies. Some observers believe that resistance breeding will not prove to be a sufficient control measure against serious pests of many crops aside from wheat and rice, so other strategies should receive more attention.

As the demand for food grows, while the quantity of agricultural land remains rather fixed, farmers must produce more intensively, which means that more inputs are needed. Unless alternatives are found, it may be inevitable for developing nations to become more like industrial countries in their employment of agricultural chemicals in food production systems. An appropriate activity for the centers may be expanded work on evaluation of pesticides, including naturally derived compounds, and research on pesticide safety, in addition to other measures.

Tropical land use

The degradation of tropical land is proceeding at an alarming rate. Of the world's 1 billion hectares of tropical forest, about 440 million hectares had been cleared by 1980. About 150 million hectares were in permanent agriculture, 210 million hectares were in shifting agriculture, and 80 million hectares were so degraded that they supported only unproductive vegetation.

In many wet tropical areas, when forest is removed, soil fertility declines and erosion occurs or soils aggregate into brick-like consistency if the land is not rapidly returned to a high density cover crop. With improper clearing, the destruction may not be limited to the cleared area, and may extend to downstream fields and water supplies. Yet the question is not how to prevent all forest clearing, but what techniques of removing the forest and using the land for agriculture are most sound.

Whether the centers' work speeds or slows the degradation of tropical lands is uncertain. There is little doubt that, without the modern varieties, total grain production would have been lower and that food shortages would have placed more pressure on the tropical land frontier. Over the past decade, perhaps an additional 10 million hectares of forest would have been felled to produce the food that has been grown through more intensive cultivation of existing farm land, which was made possible by the introduction of modern varieties.

It is more difficult to speculate on the effect of modern varieties on slash-and-burn cultivation. On one hand, higher production may have caused some slash-and-burn areas to revert to a longer fallow period; on the other, lower production costs may have encouraged growers to seek short-term gains by opening marginal land that is irreversibly destroyed after a few years of cultivation.

The centers' concentration on subsistence food crops means that they are working with annual crops, which cause more strain on soils than do perennial tree crops like rubber, coconut, or coffee. Yet the centers address the more stable and productive areas in which their crops are growing because, there, technological advances have the greatest potential for increasing food production. In addition such areas are less vulnerable to over-cropping. Increased attention to risky areas might cause some slackening of output gains in more stable, high production areas.

The centers are at present mainly concerned with, and judged by, the productivity (usually measured as yield) and stability of the farming systems with which they work. In order to shift centers' attention to technology for more marginal areas, sustainability (ability to maintain productivity over an extended period that may include unpredictable disturbances) and equity would have to rank with spread of varieties and increase in output as measures of the performance of the system.

The physical, social, economic, and institutional aspects of management of renewable resources in the humid tropics are numerous and highly complex. It is doubtful that the centers at present have the resources to undertake research and to seek greater involvement with the wide range of national institutions that affect the sustainability of the ecosystem under agricultural exploitation. Yet the importance of the issue is a compelling reason for the centers involved in tropical crops to continue to assess the options for research that might have an impact.

Biological nitrogen fixation

Research on biological nitrogen fixation has been a continuing component of the programs of the centers with leguminous crop mandates—CIAT, ICRISAT, IITA, and, more recently, ICARDA and ILCA. IRRI has also had a longstanding commitment to research on biological nitrogen fixation associated with rice cultivation.

Those centers have made a significant contribution of new knowledge directly through their own research and indirectly through the attention they have focused on the research needs of their mandated crops among researchers in some industrial and developing countries.

The research output has had limited application in farmers' fields. In many instances, the potential impacts of the research accomplishments in the area of biological nitrogen fixation are masked by the dominance of other limiting factors, both agroclimatic and socioeconomic.

Research on biological nitrogen fixation at the centers has helped to improve the quality of research in national institutions. Among the scientists of the centers undertaking biological nitrogen fixation research, there are opportunities, so far unrealized, for more synergistic research efforts.

In the future, biological nitrogen fixation research should emphasize the management of nitrogen fixed biologically within the context of the cropping systems that are commonplace in tropical agriculture.

Future returns from research

It is reassuring that investment in agricultural research has paid handsome dividends in many regions and during many periods. It would be naive, however, to expect the system of centers, which has rapidly grown in scope and complexity, to sustain the exceptional rates of return of the past, unless it responds with flexibility and vigor to opportunities presented by the new biotechnology and other advances in knowledge.

The early successes in wheat and rice sprang from a rich stock of knowledge that existed before the centers were formed. Pre-existing stocks of knowledge were less ample for many of the other crops that the centers now address, and the potential for increases in output of those crops is more modest because they tend to be grown in harsher environments.

If, as a consequence, future returns to research are lower, the enthusiasm of donors for the centers could slacken. On the other hand, creating unrealistic expectations could be equally unfortunate. Nor can it be presumed that all programs at all centers are planned, organized, and conducted optimally. Improvements could no doubt be made by reducing or eliminating some programs and expanding others, and changing the way some programs are operated. These matters are the responsibility of the CGIAR's Technical Advisory Committee, which regularly reviews the work of all centers.

As national systems become stronger, the centers' emphasis will likely shift from producing readily adopted technologies to supporting the generation of new technologies by national systems. And as this occurs, it will be less easy to use the spread of varieties as an indicator of the value of the centers. An effort should be made to estimate future impacts as precisely as possible despite the far-from-perfect understanding of the mechanisms of generation and diffusion of technological change.

Since research opportunities always exceed research funds, decisions are continually being made about the allocation of resources. Informed insight, experience, and accumulated knowledge have always formed the cornerstone of decisions about research funding. Quantitative estimates of possible future benefits can serve as additional elements in making decisions. They can help in the ranking of projects, suggest where shifts in emphasis might raise total returns, and indicate projects whose expected payoff is unattractively low.

A review of the broad sweep of expected results from the centers indicates that some impressive gains may be made, particularly in technologies that are applicable to large areas. At almost every center, if just one major project meets expectations, it will generate returns far exceeding the cost of the center. In fact, there are a few undertakings that, if any one is successful, will generate benefits greater than the present costs of the entire CGIAR system.

Six projects and their expected impact on production were analyzed in some detail: improvement of upland rice for favored areas of Latin America, biological control of cassava pests, aluminum tolerance in wheat, heat tolerance in wheat, downy mildew resistance in maize, and true potato seed. Even after conservatively estimating gains in productivity and attributing only a small share of those to the centers, expected annual rates of return range from 20 to 40 percent. The high prospective rates of return reflect the fact that the centers' work is applicable to broad areas, so even small advances in productivity have an impressive payoff.

The international centers of the CGIAR system: Emphases, core funds, staffing

A study of the international agricultural research centers

At its November 1983 meeting, the Consultative Group on International Agricultural Research approved a proposal for a study of the 13 international agricultural research centers. Support for the study, both financial and in kind, was provided by the World Bank, Sweden, the United States, the United Kingdom, France, the Federal Republic of Germany, Canada, the Netherlands, Australia, and the United Nations Development Programme. The study director, Jock R. Anderson, began work in February 1984. Other members of the study team were identified and hired as early as possible.

The study had one major objective: to determine the impact that the CGIAR centers have made on agriculture in the Third World. Two distinct aspects were identified: (a) the contribution that the centers have made by helping developing countries improve their own agricultural research capabilities, and (b) the contribution that the centers have made, directly or in collaboration with national programs, toward developing research innovations that facilitate the increase of food production.

Case studies in some two dozen developing countries were commissioned to gather information bearing on the first aspect. Those case studies, plus other sources of data or information, were the basis for judgments on the second. In addition a series of studies was conducted on particular activities through which the centers might be expected to have had an impact.

The reports. Three types of reports are being published: a main volume, individual study papers, and this summary. The main volume was prepared by the study team consisting of Jock Anderson, Robert Herdt, Carl Pray, Grant Scobie, and Hans Jahnke. It is based on papers drafted by members of the study team and Jack Hawkes, Brian Hardaker, Janice Jiggins, Michael Lipton, Richard Longhurst, V. Rajagopalan, P. K. Aiyasami, Paul Teng, David MacKenzie, Robert Brinkman, Michael Nelson, Robert Bell and colleagues, and Jake Halliday. This summary of the main report was prepared by Steven Breth.

The advisory committee. A committee consisting of Frank Press, chairman, Joachim Weniger, Jonah Kasembe, I. G. Patel, Sir Ralph Riley, Luis Crouch, and Yujiro Hayami advised on the conduct of the study. In January 1984, the committee met and agreed on the scope of the study and a general plan of work. In October 1984, it reviewed the progress and some of the early documents, revised plans for completion, and drafted a preliminary report for the meeting of the Consultative Group in November 1984. In July 1985, the committee reviewed drafts of the main report and its summary, and advised the study director on preparation of the final documents. At its final meeting, the committee also had the benefit of a commentary prepared by a panel of independent authorities from the developing countries: Farzam Arbab, Martin Piñeiro, Phillip Chigaru, S. W. Sadikin, Jonah Kasembe, and Francis Idachaba.

CGIAR Secretariat • Consultative Group on International Agricultural Research • World Bank • Washington, D.C. 20433 • USA—1985

Miss **Schneider**. Do you know what the ratio of male to female participants are in these three different programs or centers?

Dr. **Brady**. My guess is that—I don't know, but my guess is that the staff members would be dominantly male. I know of some female members, but most of those that I know of are men.

Miss **Schneider**. I wonder if you could please provide this Committee with those ratios of those three centers, of how many men and how many women?

Dr. **Brady**. I surely could.

Miss **Schneider**. I am just very curious, and I think it might contribute to all of our learning processes to know how effective that effort really is.

[The material follows:]

While staffing information is not available from all of the international agricultural research centers, the following table contains the most current senior scientific and administrative staff information available (collected in 1983) from the Consultative Group on International Agricultural Research (CIGAR).

CGIAR Center	Location	ACRONYM	Male	Female
Centro Internacional de Agricultura Tropical	Colombia	CIAT	67	5
Centro Internacional de Mejoramiento de Maiz y Trigo	Mexico	CIMMYT	75	2
Centro Internacional de la Papa	Peru	CIP	67	6
International Board for Plant Genetic Resources	Italy	IBPGR	15	0
International Center for Agricultural Research in the Dry Areas	Syria	ICARDA	58	5
International Crops Research Institute for the Semi-Arid Tropics	India	ICRISAT	83	1
International Food Policy Research Institute	U.S.A.	IFPRI	27	3
International Institute of Tropical Agriculture	Nigeria	IITA	95	1
International Livestock Center for Africa	Ethiopia	ILCA	47	3
International Laboratory for Research on Animal Diseases	Kenya	ILRAD	30	0
International Rice Research Institute	Philippines	IRRI	97	7
International Service for National Agricultural Research	Netherlands	ISNAR	24	5
West Africa Rice Development Association	Liberia	WARDA	51	5
	Totals		736	43

The totals represent a ratio of approximately 17 to 1 for male to female professional staff in the CGIAR system.

The International Council for Research in Agroforestry (ICRAF), located in Kenya, has a professional staff composed of 21 males and 5 females, a ratio of about 4 to 1.

The following staffing information was received from the International Center on Insect Physiology and Ecology (ICIPE), which is located in Kenya, after the original insert was submitted.

	Male	Female
International Professional Staff	40	3
Senior Staff (Administrative and Technical Support)	21	9
Postdoctoral Research Fellows	7	3
Visiting Scientists	5	1
Scientist-in-Residence	-0-	1
Totals	73	17

These male to female staff totals represent a ratio of about 4 to 1.

Miss **Schneider**. I also wanted to ask you what type of consideration has been given to pursue semi-arid agricultural research instead of in U.S. universities, to pursue those studies in Africa itself?

Dr. **Brady**. Well, even that which is done by U.S. universities is almost entirely done in Africa now.

Miss **Schneider**. That is not my understanding in speaking with some of the AID project officers directly in Africa. It is my understanding that there is a lot of frustration in that too much research is being done in the universities in the United States and not nearly enough is being conducted within the country itself.

Dr. **Brady**. Well, may I just comment? These international centers are all 25 percent funded by the United States, and they are located in Nigeria, Ethiopia, and Kenya, and so all of those funds go to Africa.

Another of the centers, the headquarters of which is located in India that we put up 25 percent of the money, has a headquarters for Africa in Niamey, Niger, and so those funds are all being spent there.

The only funds that—one other thing. I mentioned that we had programs helping national programs, national research institutions develop themselves. The work that U.S. universities are involved in there, the teams are—95 percent of the funds would be spent and the work would be done by U.S. university staff members located in Africa.

Now, I mentioned that some of this research work was being done collaboratively by U.S. universities and overseas. The U.S. university puts up 25 percent of the money, independent of what AID puts up, for this activity.

They may be breeding some sorghum plants. They may be making some crosses in the United States. But they are tested out in the developing countries, and they have this collaborative working relationship. So even in these collaborative exercises, the resources would be used primarily for work overseas.

Some of this money will be used to train overseas nationals here in the United States, but every bit of their activity is focused on the programs overseas.

Miss **Schneider**. I have about four other questions I want to ask, and I have a limited amount of time. I wonder if you could tell me of AID's total support for agricultural research in Africa, for example, last year, 1984.

Dr. **Brady**. About $95 million.

Miss **Schneider**. $95 million?

Dr. **Brady**. $95 million.

Miss **Schneider**. Now, what is the breakdown? What percentage of that $95 million goes for crop export versus food crops?

Dr. **Brady**. It will all go for food crops. We do not support research on export crops.

Miss **Schneider**. You don't?

Dr. **Brady**. We are being criticized by some people because they say, well, that is the way you help them economically. But our support is for food crops exclusively. This meeting over at the World Bank is all on food crops.

Miss **Schneider**. Has your budget for food research over the past couple of years been increasing or decreasing or staying about the same?

Dr. **Brady**. Well, the support for agriculture research—I am going on the basis of memory, and I may have to qualify this as we go back and look—the support for research in all sectors worldwide has gone up slightly in the last 4 years, because the administrator agrees with me that one of the primary responsibilities we have is to try to help these people develop new technologies, because that is what we did in Asia, and we succeeded, and we are trying to do the same thing here.

For the international centers, our support for the international centers, the increase since this Administration, since the first budget that they had anything to do with, has actually gone up less rapidly than the overall budget of the Agency. So even though it has gone up, it has not gone up in proportion to the rest of the Agency's budget.

If you are interested in the breakdown, a high proportion of our research work has gone into supporting cereals research on maize, wheat, rice, sorghum, millet, those kinds of crops.

Miss **Schneider**. Right.

Dr. **Brady**. About 13 percent has gone for research on animals, and 15 percent has gone to research on the roots, tubers, legumes, and oil seeds, and in the developing of systems such as this alley cropping system that I was talking about.

Miss **Schneider**. It has been brought to my attention that the request for the budget for agricultural research to the Congress was $40 million more than you had in 1985, but yet, as it turns out, it looks like you are only going to be getting $5 million more. How is that going to impact some of the plans that you have been discussing today, considering you are not getting as much as you wanted?

Dr. **Brady**. I am not sure I recognize the figures that you are referring to.

Miss **Schneider**. These are figures for the agricultural research authorization from Congress.

Dr. **Brady**. Well, the authorization from Congress, if I understand it correctly, is for an agriculture item, and so I don't even believe that that final decision has been made, but if there is $40 million in there that is more for agriculture research, I am delighted. I didn't know about it.

Miss **Schneider**. Well, no, I am saying that the request was for $40 million more, but the actuality is only $5 million more.

Dr. **Brady**. I think the bilateral assistance that we request from Congress, it comes in one item of agriculture, and so I do not know of any such increase having been made. There are lots of things that go on in the Agency that I don't know about, but in terms of agriculture research, I am simply not aware of that kind of request.

Miss **Schneider**. All right. Well, maybe we can follow up on that a little bit later.

Dr. **Brady**. Sure.

Miss **Schneider**. My chairman wants me to quit, but I have one more question. Oh, no, you just want to hold my hand? Shame on you. [Laughter.]

Dr. **Brady**. Incidentally, I guess I should not mention the fact that I am an emeritus professor from Cornell University.

Miss **Schneider**. Well, I hope, as an alumnus, you will make sure your college gets its act together and takes good care of us womankind.

Mr. **Scheuer**. I would like to ask my colleague, does that condition still prevail that you discussed?

Dr. **Brady**. No, no.

Miss **Schneider**. No, fortunately, it does not. But that is not to say that there may be isolated incidences. I certainly don't want to point the finger at Cornell right now because they have cleaned up their act since the law required them to.

Dr. **Brady**. That was the situation years ago.

Miss **Schneider**. But now the law has been narrowed in scope, and so whether or not this university and others have reverted to it remains to be seen, because the investigations into those 61 complaints has not been completed by this administration.

I have another question I wanted to ask you. To what degree is the research being done by AID coordinated with some of the other Federal agencies; for example, with EPA or with the Department of Agriculture? Is there some coordination taking place, or is it pretty isolated?

Dr. **Brady**. I think, with the Department of Agriculture, the coordination is very good. As you know, the Department of Agriculture, in some of the countries, will have an agricultural attaché located in the embassy, and they, through Public Law 480-generated local funds, will be organizing some research.

I know, for example, in India the U.S. Department of Agriculture is very much involved with AID as we determine how we are going to be working with India.

Miss **Schneider**. Well, that is good to hear.

Dr. **Brady**. It is certainly true in Egypt and in Israel. That is on a country-by-country basis. The Assistant Secretary for Science and Education in the U.S. Department of Agriculture and I are old buddies, and we are consistently writing back and forth seeing that research conferences get set up in such a way that we have the interaction.

Now, with the Department of the Interior, likewise. We handle this because we also have some of their staff members on RSSA's. That is a government program by which we can make use of them to help do the things we want done. So I think we are tied in very well there.

Miss **Schneider**. All right. What about the Environmental Protection Agency? They are rather important to the entire resource development process.

Dr. **Brady**. Yes; as a matter of fact, I chaired the interagency governmental effort on biology diversity, and EPA had representation there.

Miss **Schneider**. But are you pretty well connected with what they are doing and attempting to interact with them?

Dr. **Brady**. Yes; here again, AID, I think, has taken the leadership of developing donor agencies around the world in being certain that environmental aspects are taken into consideration, and we worked with EPA in trying to set up those guidelines. We also worked with the World Bank in getting their guidelines set up and involved EPA in this process.

Miss SCHNEIDER. Well, let me mention that technology transfer, particularly insofar as appropriate technology is concerned, has really blocked commercialization of some of these technologies in countries such as Africa.

Do you think that the idea of a clearinghouse for technology transfer would be useful in speeding up commercialization in Africa and elsewhere?

Dr. BRADY. I have not given this a great deal of thought, but I guess I would have some concern because, quite frankly, something that I thought was really going to work fell flat on its face, and something else that I really didn't think had much of a chance, getting into a different culture, took off like a house afire. And so I would be very leery of a clearinghouse. I am terribly afraid that you would get tied up in bureaucracy and the real winners would be going around you.

Miss SCHNEIDER. Well, one of the things that I noticed that seemed to be so all-pervasive in Africa was just the need for knowledge, just the need for information, and the fact that we didn't seem to have any good mechanism, at least from my brief experience there, in transferring information and technology.

It seems to me that the American taxpayers are spending money for a considerable amount of research, and we are spending, then, for the transferral of those programs. How we can get them to Africa is an important question. So it is a strategic and a mechanistic kind of proposal that I would like you to think about, and when you have an answer, please come back to us.

Dr. BRADY. All right.

Miss SCHNEIDER. Thank you very much for your testimony.

Dr. BRADY. Thank you.

Miss SCHNEIDER. I am getting the hook. [Laughter.]

Mr. SCHEUER. Thank you for a very interesting 5 minutes, my colleague. [Laughter.]

Dr. Brady, you have been an extremely interesting witness. You have seduced us both into having exceeded our normal time. We both had a very rubbery 5 minutes of questions.

We thank you very much, and we look forward to hearing from you and seeking your advice and counsel in the future. You were an enormously interesting witness. Thank you.

Dr. BRADY. Thank you, Mr. Chairman. I hope you will excuse me to go back over and join the World Bank meeting.

Mr. SCHEUER. Yes, indeed.

Dr. BRADY. And I will leave some of these materials for you if you would like.

Mr. SCHEUER. Thank you very much. We thoroughly enjoyed hearing you.

All right, now we will invite the panel on appropriate technology to come to the table: Albert Meisel, executive director of the League for International Food Education, otherwise known as LIFE, a splendid acronym; Dr. James Aronson, professor of agronomy at Ben-Gurion University of the Negev in Israel; and Peter Freeman, consulting geographer.

We will proceed with each of the witnesses, and then we will have some questions for all of you when the three of you have finished your testimony.

I would ask you, as we asked Dr. Brady, not to read your testimony but to chat with us informally and sum it up in 5 or 6 minutes, and then we will have time to ask you questions. So we will go in the order in which I introduced you all.

Albert Meisel, executive director of LIFE.

STATEMENT OF ALBERT MEISEL, EXECUTIVE DIRECTOR, LEAGUE FOR INTERNATIONAL FOOD EDUCATION

Mr. MEISEL. Thank you, Mr. Chairman, and thank you for the plug for our acronym.

I will summarize, but I will also read at least a few paragraphs, because they are so closely reasoned, I couldn't possibly repeat myself extemporaneously.

I have been asked this morning to talk about household gardening, family food production, as one additional tool for helping the peoples of sub-Saharan Africa to become more self-sufficient, and I am delighted to do that because my organization has done a fair amount of work in this area, particularly over the last couple of years.

We sponsored a survey of the literature on this subject to find out what the state of the art is, because the state of the art is, to some degree, in a bit of confusion, and I need to explain why that is.

Let me just cite some of the leading findings of our study. Home gardening is a tradition in virtually every region of the world, including some of the least inhabited areas of sub-Saharan Africa. It is, in effect, one of the few development technologies that comes with a pedigree: centuries of proof that even the most disadvantaged peoples on Earth have had the resources, skills, and personal motivation to adopt it.

Despite this credential, and despite the successful promotion of both large and small-scale gardening projects in many developing countries, home gardening remains something of a "stepchild" in development programming as far as most international donors are concerned, and I would like to cite a few of the reasons why we believe this is so.

The review suggests, first of all, that when home gardening has been promoted by the large development organizations, it has usually been just one component of multi-faceted nutrition improvement projects containing, on an average, six other discrete program activities. Some of these, such as nutrition education, clearly complement gardening objectives. Others, such as the free distribution of food, appear to conflict with them.

Unquestionably, gardening projects have a role to play in improving nutrition. However, incorporating them into omnibus programming efforts has made it very difficult to evaluate their effects on nutrition and, consequently, their cost-effectiveness compared to more measurable alternatives, such as the distribution of vitamin capsules.

As the produce grown in home gardens is frequently intended primarily for home consumption rather than for sale, moreover, their economic benefits to the household have been difficult to document as well.

Second, although the community-level gardening projects undertaken by many private voluntary organizations have been potentially much easier to measure, they have all too often not been adequately assessed, in part because these organizations typically lack the staff and resources to maintain comprehensive records on their projects.

Third, garden projects are not easily programmed from the top down. That is, developers cannot simply lay a grid over an area and determine to develop *x* numbers of gardens; rather, they must proceed community by community, employing particular sensitivity to local conditions, practices, and desires.

Moreover, individually, such projects produce small rather than large aggregates of food and require relatively small infusions of funds. These characteristics make them something of a programmatic and administrative nuisance in the eyes of some donors.

Fourth, it is LIFE's experience—and the study seems to confirm this—that when gardening projects fail, poor planning and improper implementation—what might be called pilot error—are most often responsible. Projects are placed in the wrong locations, where there is no tradition of gardening, say, or insufficient water; or new vegetables are introduced without proper preparation of the target population; or developers work through the wrong community organizations; and there are a number of other reasons.

Now, having said that—that is on the negative side of the ledger—now let me say what the study clearly shows the advantages of gardening are.

Home gardens provide calories for the undernourished and can upgrade diets deficient in protein, vitamins, and minerals; that is, they can improve family health. They may contribute the only source of certain nutrients available to households and the major or only source of food intake between harvests, when harvests fail, or when cash crop prices fall.

They can provide a source of cash income for families and/or reduce household food expenditures, allowing family incomes to be spent for new enterprises or to buy needed commodities. In at least one documented case, they have provided an alternative to villagers' outmigration in search of wage labor.

Home gardens can reduce a family's debt to, and dependence on, traders during hard times and traditional hungry seasons. They can provide medicinals, pest deterrents, and natural fertilizers. They are a source of fuels. And I could go on and on and on.

Well, what can we conclude about all of this, and what should be done about what we conclude?

First, as gardening has been something of a stepchild of the development process, practitioners have pretty much had to go it alone by trial and error. They have had no body of accumulated knowledge to fall back on and little means of learning from one another's successes and failures.

My organization has, in a modest way, tried to do something about this, but we believe that more needs to be done. We ourselves are, at the moment, trying to raise funds to establish a modest gardening center that would, one, provide technical assistance to private practitioner organizations, so that we can help them avoid some of the more common pitfalls in programming and assist them, on demand, in their project planning and implementation, in the on-site training of staff, and in establishing proper recordkeeping and evaluation procedures; two, commission needed research; and, three, function as a center for the collection and exchange of information. We don't necessarily say that we ought to do this, but somebody ought to do it, and that seems to be by agreement of all of those of us who are concerned in this area.

Second, as we have seen, there is a palpable need for the development of better data on the accomplishments of gardening projects, and I have alluded earlier, in breathless fashion, about what some of the inhibitions to that are.

There is one attempt at the moment—as a matter of fact, Dr. Brady's Office of Nutrition is currently sponsoring an effort to try to measure some of the economic and nutritional benefits that we hope will result in some instruments that can in fact measure what these benefits are. That is, what I am saying is that we know that there are benefits, but it is hard to prove, and for the donor agencies to become more interested in this particular activity, we are going to have to come up with more of this kind of hard data.

On the other hand, that is very difficult, too, because, in point of fact, to measure nutritional or economic improvement, you almost have to follow people around with a pad and pencil and do all kinds of measurements, and who has got the money or the time to do that, and is it worth doing to an extensive degree? So what I am arguing for here is in fact to do this, but with moderation; that is, we need to show the donor agencies that there are concrete benefits that they can put their money behind, but to do it not in such a way that it becomes a burdensome thing for the private organizations or for the other agencies that are trying to develop these kinds of programs.

Third, as many parts of sub-Saharan Africa are arid, practitioners will need to learn more about drylands gardening. To date, most of the work has been done in tropical areas, where, for obvious reasons, gardening is much easier. In addition to LIFE's upcoming dryland gardening manual—and I didn't have to time to mention the fact that we are in the process of preparing a manual that we hope will help field workers to develop gardening—but it would be useful for someone to undertake the kind of model garden that AID, for example, has helped to develop in Asia at the Asian Vegetable Research and Development Center in Taiwan, which is one of the centers that Dr. Brady was alluding to earlier, although not quite; because it is in Taiwan, it has a certain special status. And it would be useful to develop a similar model for Africa.

Finally, I would simply like to say the obvious: If gardening projects are to contribute to the amelioration of conditions in sub-Saharan Africa to the extent that I and others believe that they can, there must be reasonable funding—that is, more than is available at present. A few additional millions—not many, because this is a cheap technology, or inexpensive technology—and it should be allocated essentially for allowing particularly private organizations, I think, to help do this kind of programming.

Private organizations work best at the grassroots level. Now, they can be funded by AID and some of the other international funding agencies. The work is best done, I think, by the private agencies and by organizations like the Peace Corps, which is in fact heavily involved in gardening. We are helping to train Peace Corps volunteers in this area, for example.

I think, just to sum up, nobody says that gardening can solve all of the problems of food production in Africa. Clearly, that would be foolish. There does seem to be, from the research that we have done, sufficient evidence to show that when this particular technology is applied intelligently and is carried out by people who are trained to do it—and the area of training I cited as one of the areas where we need to do more work—then it can help not only add to the food supply but make families more self-sufficient in two ways; that is, by adding to the food supply and by getting—I am talking about nutrition-oriented—helping people eat better and therefore be healthier.

They can sell some of it so that they are economically better off, and perhaps the most important is, it makes people more self-sufficient.

Congresswoman Schneider, if I can just anticipate your question a little bit and say one thing——

Mr. SCHEUER. You are engaged in a very dangerous exercise. [Laughter.]

Mr. MEISEL. I know. I think the Congresswoman knows what I am about to allude to. It is sometimes stated that by encouraging gardening in Africa, where most of the farming work is done by women, you are in effect adding to the burden of women, and I guess I don't think that is so, and our research would indicate that that is not so, and let me just tell you why I think not.

One is that at least the literature survey that we did shows that gardening is not in fact all done by women. That is one of the beauties of it, that it can be done, also, by people who are otherwise not productive and cannot add to the family budget; that is, older people, children, and sometimes even the men, curiously, because they take an interest.

The other is that since gardening is, in a sense, a community development technique, if you develop gardening projects, you can add things to it, and it is a great way to in fact train women in nutrition, to add to their resources; and when the family becomes more self-sufficient, the woman becomes more powerful. That is my belief, in any case, and I think that belief is shared by a great many other people.

I had a beautiful peroration written, but I won't read it. Thank you so very much for your attention.

[The prepared statement of Mr. Meisel follows:]

"Hunger in Africa: Prospects for Sustainable Development"

The Role of Household Gardening

Testimony Before the Committee on Science and Technology
U.S. House of Representatives
October 30, 1985
By Albert Meisel
Executive Director, League for International Food Education

My name is Albert Meisel, and I am the executive director of the League for International Food Education. L.I.F.E., as it is known, is a consortium of professional societies whose members -- agronomists, agricultural engineers, chemists and chemical engineers, cereal grain and oil seed scientists, food technologists, and nutritionists -- assist the organization's staff in providing information and technical advice to field workers and others in developing countries on a broad range of food and nutrition-related matters. L.I.F.E.'s activities are supported mainly by funds provided by the Office of Nutrition of the Agency for International Development.

I am pleased to appear before you this morning to discuss the role that family food production can play in increasing the food security and nutritional well-being of the peoples of sub-Saharan Africa. L.I.F.E. has long had a special interest in household gardening as it applies to development. We have sponsored a number of workshops, training programs and publications on the subject. Three of our recent activities in this area are, I think, especially relevant to the challenge of addressing hunger in sub-Saharan Africa.

The first is a manual for field workers, to be published early next year, treating the complex subject of gardening in the drylands areas of the world. The second is the imminent publication of a training manual for field-based trainers and practitioners, newly revised to account for the experience that the Peace Corps and L.I.F.E. have had delivering this training in several developing countries. It treats an aspect of gardening still relatively unknown in development circles, but which has, I believe, exciting potential: How to design "mixed gardens" which address the particular nutritional deficiencies of a given community, using traditional techniques that take maximum advantage of the natural resources scarce in so many parts of the developing world.

The third activity I wish to cite is L.I.F.E.'s publication earlier this year of what is probably the most extensive survey to date of the literature on gardening in development. Entitled "Home Gardening in International Development: What the Literature Shows," and prepared by development anthropologist Leslie Brownrigg, the review reveals much about what we know in this field of development work and, equally useful, what we still don't know.

Let me detail some of the findings of the review as they relate to the committee's concerns this morning.

- Home gardening is a tradition in virtually every region of the world, including some of the least inhabited areas of sub-Saharan Africa. It is, in effect, one of the few development technologies that comes with a pedigree: centuries of proof that even the most disadvantaged peoples on earth have had the resources, skills, and personal motivation to adopt it.

- Despite this credential, and despite the successful promotion of both large and small-scale gardening projects in many developing countries, home gardening remains a "step child" in development programming as far as most international donors are concerned.

Why is this? The review suggests four reasons. First, when home gardening has been promoted by the large development organizations, it has usually been just one component of multi-faceted nutrition improvement projects containing, on an average, six other discrete program activities. Some of these, such as nutrition education, clearly complement gardening objectives; others, such as the free distribution of food, appear to conflict with them. Unquestionably, gardening projects have a role to play in improving nutrition. However, incorporating them into "omnibus" programming efforts has made it very difficult to evaluate their effects on nutrition, and consequently their cost-effectiveness compared to more measurable alternatives, such as the distribution of vitamin capsules. As the produce grown in home gardens is frequently intended primarily for home consumption rather than for sale, moreover, their economic benefits to the household have been difficult to document, as well.

Second, although the community-level gardening projects undertaken by many private voluntary organizations have been potentially much easier to measure, they have all too often not been adequately assessed, in part because these organizations typically lack the staff and resources to maintain comprehensive records on their projects, or to evaluate their results in any systematic way. Few programmers keep sufficient records on such matters as: the number of gardens developed, their longevity, or even the amount and kinds of food grown and the costs of raising them. The lack of objective data on gardening projects caused by both these factors have made it difficult for donors to discern what they can "buy" if they support these program efforts, and what they have "bought" when they do.

Third, garden projects are not easily programmed from the top down. That is, developers cannot simply lay a grid over an area and determine to develop X number of gardens; rather, they must proceed community by community, employing particular sensitivity to local conditions, practices, and desires. Moreover, individually, such projects produce small rather than large aggregrates of food and require relatively small infusions of funds. These characteristics make them something of a programmatic and administrative nuisance in the eyes of some donors.

Fourth, as is the case with most other development efforts that require a responsive, community-by-community approach, the literature, and L.I.F.E.'s own experience, indicate that when gardening projects fail, poor planning and improper implementation -- what might be called "pilot error" -- are most often responsible. Projects are placed in the wrong locations -- where there is no tradition of gardening, say, or insufficient water; or new vegetables are introduced without proper preparation of the target population; or developers work through the wrong community organization; or the project is improperly staffed; the causes of failure can be many. One problem is that field workers tend to think that gardening projects are easier to develop than they are, and sometimes fail to take into account all of the variables involved.

What about the other side of the ledger?

As the Brownrigg study revealed, home gardens can be successfully promoted by developing countries, even as part of multicomponent programming efforts undertaken at the national level. The extensive promotions launched by the governments of India, Sri Lanka, Indonesia, the Philippines, Colombia, Chile, Dominica, Barbados, Honduras and, most recently, Bolivia, all testify to this fact. The editor of the Indian Horticulturist succinctly noted just one reason for these countries' belief and investment in home gardening with the remark: "No sophisticated machine tools, no World Bank loans, are required (for families) to grow vegetables and fruits."

Similarly, the Brownrigg study revealed that the benefits of home gardening can be documented. Surveys conducted in Indonesia, for example, have shown that the "pekarangan" -- Indonesia's traditional version of the "mixed garden" I referred to earlier -- provides up to 40% of the total calories, 30% of the total protein and 65% of the fuels consumed by rural households in some areas of the country.

Perhaps the most compelling arguments in support of gardening as a technology for development noted in the Brownrigg review, however, have to do with the reasons why people in developing countries have been gardening since the dawn of recorded time.

Home gardens provide calories for the undernourished, and can upgrade diets deficient in protein, vitamins, and minerals; that is, they can improve family health. They may contribute the only source of certain nutrients available to households and the major - or only - source of food intake between harvests, when harvests fail, or when cash crop prices fall. They can provide a source of cash income for families and/or reduce household food expenditures, allowing family incomes to be spent for new enterprises or to buy needed commodities. In at least one documented case, they have provided an alternative to villagers' out-migration in search of wage labor.

Home gardens can reduce a family's debt to, and dependence on, traders during hard times and traditional "hungry seasons." They can provide medicinals, pest deterrents, and natural fertilizers. They are a source of fuels. They fulfil symbolic, ritual, and aesthetic functions. They can be started with small outlays of funds and maintained primarily -- or even exclusively -- with locally available resources. They are often easy to tend, requiring relatively small expenditures of time and labor. They can utilize the labor of household members who might not otherwise contribute to the household budget, including old people and small children. They can be grown on small parcels of land. Once established, they are usually not affected by circumstances outside the householder's control, including fluctuations in world energy or cash crop prices, in currency exchange rates, or the priorities of local governments and foreign donors. The list goes on...

In sum, home gardening can increase the food security, the nutritional intake and the disposable income of gardening families. The relationship among these three benefits -- access to more food, to nutritious foods and to cash from the sale of surplus -- deserves special mention in the context of sub-Saharan Africa.

In light of the foregoing, what can we conclude about home gardening's role in development, and what should be done about the conclusions we draw?

First, as gardening has been something of a step-child of the development process, practitioners have pretty much had to go it alone, by trial and error. They have had no body of accumulated knowledge to fall back on, and little means of learning from one another's successes and failures. My organization has, in a modest way, tried to do something about this state of affairs; but more needs to be done. L.I.F.E. is, at the moment, attempting to find funds to establish a modest gardening center that would 1) provide technical assistance to private practitioner organizations, so that we can help them avoid some of the more common pitfalls, and assist them, on demand, in their project planning and implementation, in the on-site training of staff, and in establishing proper record-keeping and evaluation procedures; 2) commission needed research; and 3) function as a center for the collection and exchange of information. In our view, and that of others, all three of these functions need to be performed somewhere.

Secondly, as we have seen, there is a palpable need for the development of better data on the accomplishments of gardening projects. AID's Office of Nutrition is currently sponsoring one effort in this direction, the result of which, it is hoped, will be a number of instruments that can be used by practitioners, public and private, to measure, to some reasonable degree, the economic and nutritional benefits derived from their projects.

Third, as many parts of sub-Saharan Africa are arid, practitioners will need to learn more about drylands gardening. To date, most of the work has been done in tropical areas where, for obvious reasons, gardening is easier. In addition to L.I.F.E.'s upcoming drylands gardening manual mentioned earlier, UNICEF has also published a field manual for program developers. But it would be useful it someone undertook the development of a nutrition-oriented model garden for the area. (With AID funding, the Asian Vegetable Research and Development Center in Taiwan has developed such a model for Asia. It is currently being field-tested in Thailand.)

Finally, I would simply like to say the obvious: If gardening projects are to contribute to the amelioration of conditions in sub-Saharan Africa to the extent that I and others believe that they can, there must be reasonable funding -- that is, more than is available at present. A few additional millions -- not many -- judiciously applied by this government, indigenous governments, and unilateral and multilateral aid agencies could accomplish wonders.

No one would be foolish enough to claim that gardens are the answer to Africa's food problems. Nor would anyone assert that we know all that we need to about how to program them effectively. (Not everything is known about other development activities, either.) I would submit, however, that there is sufficient evidence to show that when this approach is discriminatingly and intelligently applied it can confer enormous -- even if not always precisely measurable -- benefits at relatively small cost. So should we not vigorously pursue it? Given the conditions in the region under discussion this morning, can we afford not to?

This concludes my formal remarks. I will, of course, be glad to attempt to answer any questions you may have.

ATTACHMENT I

1. WHAT IS "MIXED GARDENING?"

[adapted from: The UNICEF Home Gardens Handbook, by Paul Sommers]

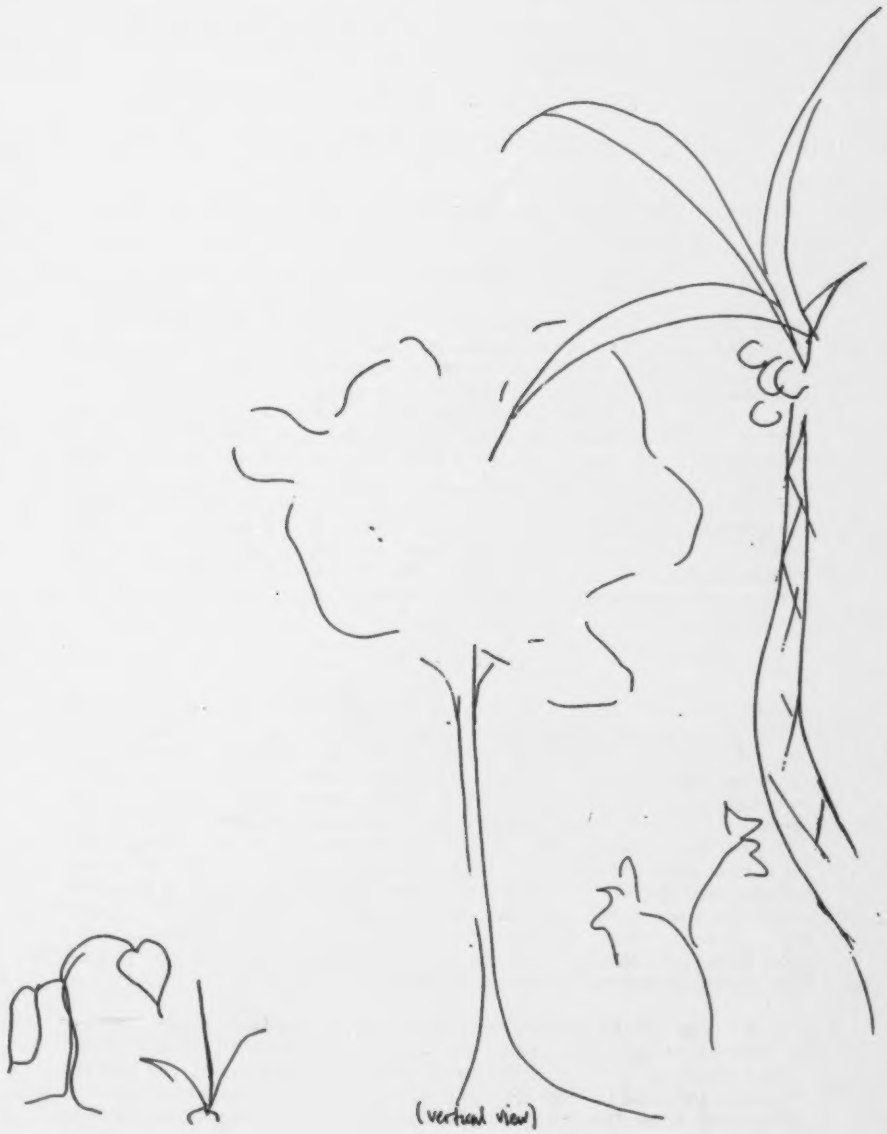
TRADITION

Mixed gardens are found throughout the world, in many micro-climates. They are called by various names: dooryard gardens, kitchen gardens, courtyard gardens, homestead gardens, pekarangan and mixed gardens. Despite the different names, such gardens are similar in basic structure and function. The term "mixed garden" will be used in this manual. As the term implies, the gardens are not designed according to the Western model, with straight rows of single crops, but instead contain an ecologically balanced mixture of annuals and perennials in a multi-story arrangment which yields various crops. Mixed gardens are the result of trial and error, and have evolved in a self-sustaining system that can provide rural households with many of their basic dietary needs while performing several other useful functions.

STRUCTURE

In the lowland humid tropics, a typical mixed garden resembles a tropical forest. Dominating the first canopy level there are coconut trees giving only light shade, and rising beneath them is a second canopy of various fruit trees. Bananas, papayas, and sugarcane are usually planted among these taller fruit trees. Bamboo is there also. Annual and perennial vines, as well as orchids, may grow on the trunks of the fruit trees. The ground level is reserved for low and trailing plants, such as sweet potato and herbs. A vegetable plot may be found in a cleared area. Climbing vines may completely engulf the household's sides and thatched roof, making the house and garden indistinguishable from one another. It is this rich mixture of many plants that warrants the name "mixed gardening."

In the Philippines, for example, a typical mixed garden is located around the house and usually contains 25-40 different edible plant species at one time; a mixture of annuals and perennials with edible shrubs and trees, as well as ornamentals, integrated into the garden. Unlike the static vegetable garden that requires replanting several times per year, the mixed garden uses fruit trees as its basic skeleton. These trees combine with vegetables to provide a continuous source of nutritious food for the household, while ornamental plants and flowers provide beauty and also attract bees for making honey and for pollination. This plant diversity creates an environmentally sound, small scale cropping system that can be largely self-sustaining.


(vertical view)

DYNAMICS

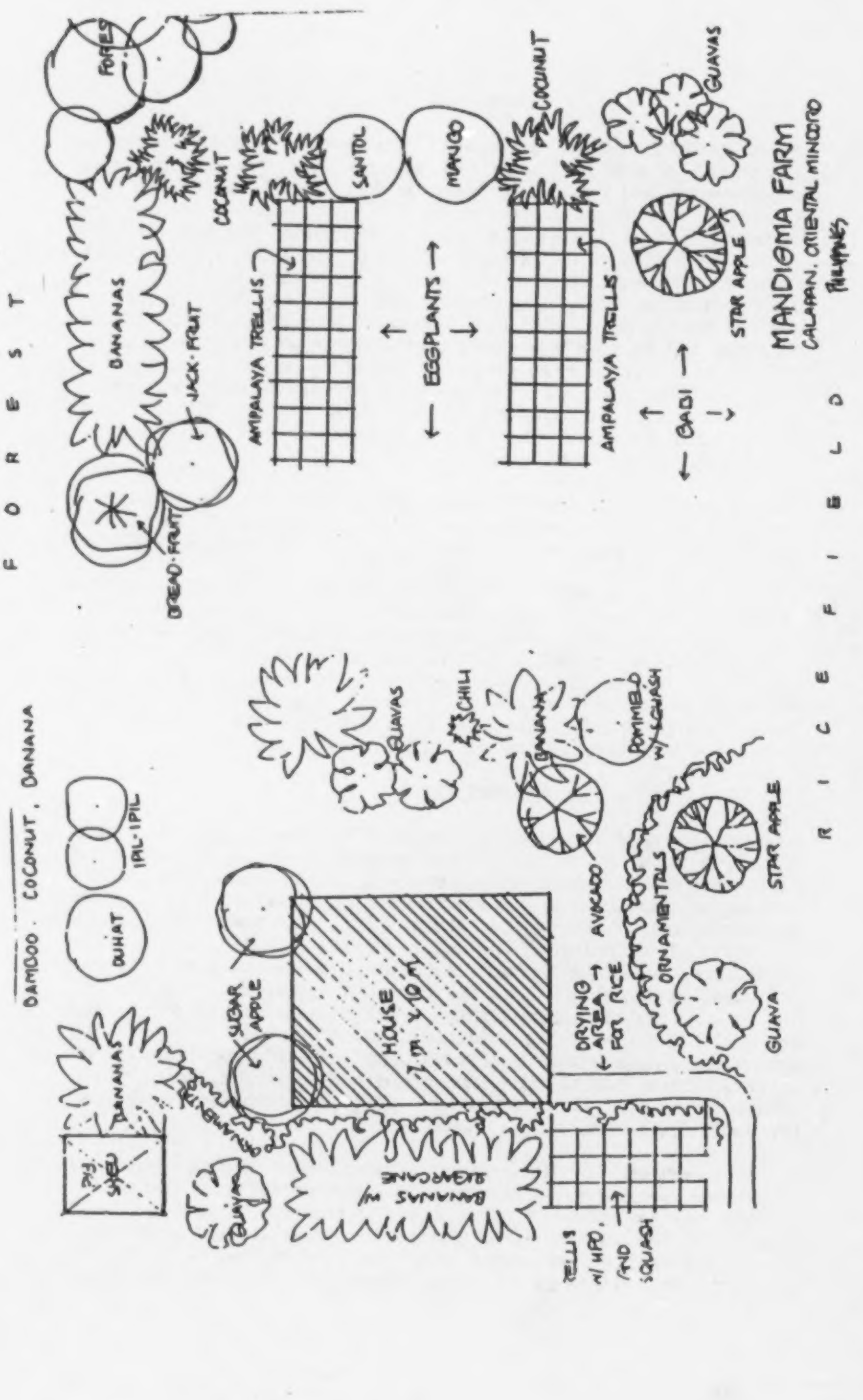
Mixed gardens utilize different light levels and root zones to establish a stable recycling pattern. The deep-rooted trees absorb water and nutrients from the deeper soil layers and also provide rich organic matter on the soil surface through the decomposition of leaves and other plant parts. The soil surface in the garden is often heavily shaded by the plant canopy, which protects the soil from heavy rain and intense solar heat and allows for an even temperature and high humidity inside the canopy. Weed growth is limited because there is so little direct sunlight and because the weeds must compete with shade-tolerant, edible trailing plants. Companion planting creates synergistic relationships: legumes, for example, may provide nitrogen indirectly to an associated crop through nitrogen fixation. In addition, most plants used in mixed gardens are indigenous and are generally adapted to the micro-climate.

The accumulation of organic matter and plants on the soil surface prevents erosion, leaching and loss of nutrients. Pesticides and synthetic fertilizers are not required. The gardens fertilize themselves through the steady incorporation of organic matter from the plants, the organic materials discarded in the course of the harvesting and processing activities that occur around the house, the manure from small domesticated farm animals, and sweepings from the kitchen. Insect and disease problems are usually minimal, due to the use of intercropping, crop rotation, resistant local varieties and other non-chemical controls. Minimum inputs, largely drawn from the garden itself or from local sources, yield a wide variety of abundant outputs in this gardening system.

FUNCTIONS

Home gardening of this type can be much more than a way of raising food. The trees in the garden can provide shade, a windbreak and firewood. The gardens also supply building materials, fiber, cooking oil, spices and condiments, cooking utensils, and materials for making mats, baskets, furtiture, hats, etc. Small domesticated animals such as chickens and ducks may be included, and provide excellent sources of dietary nutrients, as well as fertilizer. Medicinal herbs, crucial to the health of rural families who may not be able to afford or obtain a reliable source of drugs, may be included as well. In addition, these gardens can serve to demarcate boundaries, and offer the household protection and privacy. Their owners have the opportunity to supplement their income by selling surplus produce. They may also use the garden for social purposes, and religious ones.

It is important to distinguish between mixed home gardens and those that are intended primarily for commercial use. Commercial gardens may be modelled after the the Western "market garden." Raising a few varieties of produce in quantities larger than the family can consume means that the produce can be sold. The mixed garden, however, is small scale and diverse; its crops


F O R E S T
BAMBOO · COCONUT, BANANA
DUHAT
IPIL-IPIL
PIG SHED
BANANAS
GUAVAS
BANANAS W/ SUGARCANE
SUGAR APPLE
HOUSE 7 m x 10 m
TRELLIS W/ HPO. AND SQUASH
DRYING AREA FOR RICE
AVOCADO
ORNAMENTALS
GUAVA
STAR APPLE
GUAVAS
CHILI
BANANA
POMMELO W/ SQUASH
BREAD-FRUIT
JACK-FRUIT
BANANAS
COCONUT
FOREST
AMPALAYA TRELLIS
EGGPLANTS
SANTOL
MANGO
COCONUT
AMPALAYA TRELLIS
GABI
STAR APPLE
GUAVAS
R I C E F I E L D
(horizontal view)
MANDIGMA FARM
CALAPAN, ORIENTAL MINDORO
PHILIPPINES

are generally non-commercial and grown primarily for home consumption. In periods of staple crop shortages, the diversity of the home garden's produce helps to supply household members with staple food, while at the same time limiting their need to borrow money for food. When surpluses occur, however, householders will sell or trade the produce. Fruit trees, for example, bear a large quantity of fruit over a period of weeks or months. Households can sell some of the yield and still have enough left for home consumption. Often, garden produce sold can be exchanged for food that is not grown in the garden.

In sum, mixed gardening can be seen as a system in which nutritional objectives are compatible with economic ones. At the same time, the system's independence from outside inputs, its adaptability to different micro climates, and its ability to conserve and make maximum use of often scarce natural resources, make it accessible to a rich variety of people around the world. For these reasons, the mixed garden is highlighted in this manual as an appropriate, low-cost, small scale gardening system which can be promoted or improved as a means of advancing nutritional wellbeing in developing communities.

Mr. SCHEUER. Is it is a short peroration?

Mr. MEISEL. Yes, it is.

Miss SCHNEIDER. You may read it——

Mr. MEISEL. Actually, I did it better than I wrote it, I think, so I think I will quit while I am ahead, if I may.

Mr. SCHEUER. All right. It was very, very interesting.

All right, Dr. Aronson.

STATEMENT OF DR. JAMES ARONSON, PROFESSOR OF BOTANY, INSTITUTE OF APPLIED RESEARCH AND DESERT FARMS UNIT, BLAUSTEIN INSTITUTE OF DESERT RESEARCH, BEN-GURION UNIVERSITY OF THE NEGEV, BEER SHEVA, ISRAEL

Dr. ARONSON. Thank you very much, Mr. Chairman and members of the committee. I am delighted to be here, and I would like to briefly touch on a few points.

I only had 48 hours' notice that I should come testify, so I don't have any prepared statements to read. I would like to touch on three main points that I think need to be emphasized.

Mr. SCHEUER. Excuse me. Let me explain the 48 hours' notice. We just happened to hear by accident that you were here.

Dr. ARONSON. I am delighted.

Mr. SCHEUER. So we seized on the opportunity of inviting you here. It wasn't that we were negligent, but we just grasped the opportunity of inviting you here at the last minute because we heard about it.

Dr. ARONSON. I wasn't complaining; I was just going to say that you will having nothing but informal chat from me.

First of all, I need to set the record straight. I am not an agronomist; I am a botanist by training, and this leads to a major difference in perspective. Our distinguished witness, Dr. Brady, who is an agronomist, presented an agronomist's-eye view of development in Africa. I have a very different view which looks to wild plants that are naturally adapted to arid and saline conditions and which, therefore, do not require any biotechnological improvement, tissue culture advancement, or genetic engineering.

There are numerous plants found in the tropics, the dry tropics and the wet tropics, that could be very significant new crops for people in the Third World, and it is my belief that greater attention needs to be given to these wild plant resources.

This ties in very directly to the subject of deterioration of environmental conditions in the tropics. As Dr. Peter Raven of the National Academy of Sciences, and chairman of the Committee on Research Priorities in Tropic Biology, has emphasized so often with regard to tropic moist environments, we need to think in terms of conservation and agriculture in the same breath for the tropics.

I believe the same is true for the dry tropics, and much greater attention should be given to the possibilities of developing new crops from wild plants genetically adapted to dry tropical conditions. The challenge in dealing with such plants lies rather in developing the economic potential of these plants.

Now, the second point I would like to make is that I believe it is a mistake to focus our entire attention on the problem of food relief or food production in the dry tropics. I believe there are three commodities which need to be developed as sustainable and stable commodity supplies for the 900 million people living in the dry third of the Earth's surface. Those three commodities include food, of course, but they also include fodder for livestock and firewood.

Three-quarters of mankind still use wood as their major or only source of energy, and in a large section of the Sahel in western Africa, a World Bank-sponsored report published by Jean Grosse recently showed that the limiting factor to carrying capacity of well-fed and content humans in a large ecological zone of West Africa is in fact the shortage of firewood, more so than the shortage of food. We need to think in terms of agricultural systems that can supply sustainable supplies of food, fuelwood, and fodder if we want to approach any long-term solutions.

Now, I have been asked to speak specifically on the subject of saline water irrigation that was mentioned by yourself earlier. In Israel, we are using virtually 100 percent of our available fresh water today; yet our population is growing and we are trying to expand agriculture into the dry 60 percent of the country known as the Negev.

We have underground resources there of brackish water that we are learning how to use for agriculture with rather sophisticated technological means. As you know, we have drip irrigation technology, computer-assisted irrigation technology, and so forth and so on. We also use large quantities of fertilizers and pesticides and what have you, just as the farmers in California do.

However, faced with a situation where no fresh water is available, the farmers, aided by researchers, have learned how to use underground brackish water. We are going forward with this research now following the success that has led to the establishment of six new settlements entirely based on brackish water irrigation; we are going forward to explore the possibility of using undiluted seawater in agriculture.

This will require brand new crops. No conventional crop known will tolerate such highly saline water, but we have determined there are at least 1,750 species of plants around the world that would tolerate this type of water. If we can develop the economic potential of such plants, it might become an economic, viable approach to think of seawater-based agriculture in coastal deserts.

However, as we know from 5,000 years of experience, when you get too much salt in an agricultural system, you are going to wind up with problems. So, we feel that in many areas, saline water irrigation is not going to be the solution, particularly in areas where heavier soils and great distance from the sea will preclude it.

In such areas, I would argue that an ancient method of desert farming known as rainfall harvesting or runoff agriculture might be an appropriate system of agricultural production that could provide sustainable supplies of food, fodder, and firewood in desert areas throughout Africa and other parts of the world.

As my colleague, Mr. Meisel, was indicating, in some cases local peoples have developed systems that are better than anything foreign experts can provide, and it may be that by simply introducing a few additional appropriate species of plants and utilizing locally developed systems, we might be able to achieve far greater results than by trying to import brandnew systems developed elsewhere.

I would conclude with one final point, and that is that in contrast to research and development in the temperate zones of the world such as we are sitting in now, where every effort is made to maximize yields on the farm, in the tropical areas, including the arid and semiarid regions we are considering, I believe greater priority should be given to research and development aimed at obtaining stable yields over long periods.

I would like to make a few comments about some of the AID-supported programs that Dr. Brady mentioned, with a few words of praise and a few words of correction.

AID is supporting a trilateral research program involving Egypt, Israel, and the United States which is now in its third year, and funding is expected for an additional 3 years. This has been a tremendous success in terms of fostering good relations between Israeli, United States, and Egyptian scientists, and I believe it should be encouraged.

In addition, AID has, last year, begun a program with support from Congress called the Cooperative Development Research Program to encourage partnerships in research and development between Israelis and researchers in one of some 20-odd Third World countries. About 14 such programs will be beginning January 1, 1986, and preproposals are being submitted now for the fiscal period starting in 1987.

I personally am involved in programs that will be starting in Botswana and Kenya starting in January, and I agree with the committee and Dr. Brady that this is probably a very effective way to advance research and development in Africa.

On the subject of ICARDA in Aleppo, Syria, and in response to your question about the possibility of developing regional Near Eastern programs, I would simply like to tell a short anecdote. I met an English researcher at a conference in Yugoslavia who works at ICARDA, and we agreed to exchange letters. I sent a letter to his brother in the United Kingdom which was forwarded to him in Syria. Unfortunately, his brother forgot to remove the letter from my envelope and repackage it.

The letter was confiscated by the police in Syria, and my friend nearly lost his job, and a tremendous amount of difficulty ensued simply for the fact that he had received a personal letter from Israel.

I think that it is unrealistic to think that most of the Near Eastern countries will work with Israel in any sort of fashion in the near future apart from Egypt. We hope that this will change, but it doesn't seem to be likely.

The one exception to this has to do with water regulation, by the way. There are informal agreements existing between Israel and some of the surrounding countries dealing with management and division of water resources.

Thank you very much.

[The prepared statement of Dr. Aronson follows:]

Part 1 of the prepared statement of James Aronson given in testimony before the House Subcommittee on National Resources, Agriculture Research and Environment's hearings on Hunger in Africa, Prospects for Sustainable Development. October 30, 1985

Part 2 is a chapter entitled Economic Halophytes. A Global Review which appeared in the book Plants for Arid Lands (1985) G.E. Wickens, T.R. Goodin & D.V. Field (eds.) George Allen and Umwin, London. pp 177-188.

PREPARED STATEMENT OF JAMES ARONSON, INSTITUTES OF APPLIED RESEARCH, AND DESERT FARMS UNIT, BLAUSTEIN INSTITUTE OF DESERT RESEARCH, BEN-GURION UNIVERSITY OF THE NEGEV BEER SHEVA, ISRAEL

SELECTION AND MANAGEMENT OF DROUGHT-TOLERANT FUELWOOD AND FODDER TREES AND SHRUBS FOR ARID AND SEMI-ARID REGIONS

Description of the problem

The three most pressing needs of people in the arid and semiarid regions of developing countries are adequate and renewable supplies of food, fodder and fuelwood for both urban and local village use. Food shortages are, of course, much publicized and naturally inspire the most immediate and emotional response from observers and well-wishers in the well-fed northern countries. However, food alone is not the whole problem, and food aid, no matter how timely or generous, can never be a long-term solution.

In most rural parts of the Third World, villagers and nomads preserve strong socio-economic and cultural ties with and dependency on their livestock—be it cattle, goats, sheep, camels or other animals. For man to be well-fed and content under such conditions, his animals need ample feed as well. What's more, since animals in these areas still serve for draught, transportation, and as burden-bearers and fertilizer-suppliers, they play a crucial role in the everyday life of man, including agriculture. Just like their masters, if the animals don't eat well, they can not work well.

As the poor man's major or only source of energy, fuelwood—firewood and the charcoal made from it—is every bit as critical as food or fodder. Indeed for millions of families in Africa and elsewhere in the Third World, the procurement of fuelwood for heating and daily cooking needs costs as much or more than food procurement. On a global scale, the FAO estimates that more than 100 million people in 26 countries—18 of them in Africa—already face acute shortages of fuelwood, and it classifies 1.2 billion people as living in deficit conditions (7). By the end of this century, nearly 3 billion people—or one half of humanity—are expected to be severely affected by this "other energy crisis"—the lack of fuelwood (1).

It will be obvious to the reader that one of the most far-reaching and significant consequences of more and more people hunting farther and farther afield from their homes in search of fuelwood for their own use, and for export—often in the form of charcoal—to urban areas near and far, is the increasing deforestation of semiarid lands. This removal of woody biomass for fuel quickly leads to environmental degradation, i.e. desertification including the loss of agricultural lands. That means local and regional food production capacity decreases as well. In ecological terms, the overall carrying-capacity of the arid and semi-arid lands is decreasing worldwide, and the gap between supply and demand of food, fodder and fuelwood is increasing at a frightening rate (4,10).

Steps toward a partial solution

Most efforts undertaken to date to increase agricultural production in arid and semiarid regions have relied on massive inputs in the form of artificial irrigation. Yet such practices tend to lead to salt build-up in cultivated fields resulting in cumulative loss of productivity and, eventually, abandonment of the land.

An alternative method of raising crops in arid and semiarid regions was independently discovered in many parts of the world over 3000 years ago. It is alternatively known as rainfall-harvesting or runoff agriculture (6).

Recent Israeli research efforts in runoff agriculture, led by Prof. M. Evenari, have concentrated on demonstrating the feasibility of producing tree crops (e.g. olive, almond, pistachio and others), and to a lesser extent, fodder shrubs and annual grain crops (5). Yet in the last 3 years we have seen that these ancient techniques appear to be equally well-suited to producing other crops including fuelwood and multipurpose trees and shrubs, and equally important, may be amenable to intercropping of two or more different crops in the same fields (3). If our experiments continue to yield positive results, the outcome will be a prototype agroforestry system capable of producing a wide variety of different commodities in certain (but not all) desert environments, on a sustainable basis and without supplementary irrigation. In addition to the rainfall harvesting technique itself, this system will rely heavily on the use of perennial trees and shrubs that are better suited than annual crops to the constraints posed by insufficient and unpredictable rainfall in desert areas.

Concomitant with the development of runoff agricultural techniques, over the past thirty years Israeli researchers have accumulated expertize in selecting appropriate plant materials for a wide variety of purposes and for cultivation under relatively harsh conditions (2,8,9,11,12). Many species, variety and lines of drought-tolerant trees and shrubs with multipurpose value have been identified as having a high potential for production under rainfed conditions. Examples are the following: *Acacia salicina, Eucalyptus occidentialis, Casuarina glauca* and *Prosopis alba* among the trees, and *Atriplex nummularia* and *Cassia sturtii* among the shrubs. Various means of vegetative propagation have been developed to enable us to preserve and enhance outstanding characteristics of selected lines and individuals among the most promising species of trees and shrubs.

The challenge before us at this time is to combine low-cost, appropriate means of tree and shrub production with the best available species and selected lines thereof to provide sustainable means of food, fodder and firewood production in arid and semi-arid regions. Concomitantly, animals studies are needed to learn how best to integrate desert-hardy livestock of various kinds (sheep, goats, camels, etc.) with the rainfall—harvesting agroforestry systems under development. Finally, efforts are now underway to establish a pilot-scale research and development program in northern Kenya which would serve as a demonstration and training center to complement the ones already existing at the Avdat and Wadi Mashash farms in southern Israel.

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13. ECONOMIC HALOPHYTES—A GLOBAL REVIEW: JAMES ARONSON, BOYKO INSTITUTE FOR AGRICULTURE AND APPLIED BIOLOGY, BEN-GURION UNIVERSITY OF THE NEGEV, BEER-SHEVA, ISRAEL

INTRODUCTION

Not less than about 400 million ha and perhaps as much as 950 million ha of land in arid and semi-arid regions may be salt-affected from natural and anthropogenic causes (Massoud 1974, Ponnamperuma 1977). Definitive data on the annual worldwide loss of farmland due to salinization and related causes is lacking. However salinity is unquestionably the most important problem of irrigated agriculture (Dregne 1977), and one-fifth of the irrigated lands of the world, approximately 47 million ha, is salt-affected today (Maas & Hoffman 1977).

Reliable estimates suggest that in the Mediterranean region alone, some 15 million ha have become seriously salt-affected due to man's activities (Le Houérou 1984). In India over 6 million ha, of a national total of only some 40 million ha of irrigated farmland, have been made useless by salinity and waterlogging, while about 40 thousand ha are being abandoned each year (Chapman 1975a). Well over 500 thousand ha of Californian soils (USA), particularly in the Coachella, Imperial and Sacramento—San Joaquin Valleys had been strongly affected and made useless to agriculture by 1963 (Weir 1963, cited in Kelley *et al.* 1979); and the United States as a whole reportedly loses 80-120 thousand ha of cropland each year due to salt build-up (Yensen *et al.* 1981).

The problem is hardly new. Early civilizations in the Indus and Nils valleys and in the Peruvian costal region were all apparently drastically affected as the build-up of salts in their fields gradually led to yield losses and eventually to crop failure. A similar phenomenon is thought to have contributed to the collapse of the early Mesopotamian civilization in the Tigris—Euphrates valleys (Jacobsen & Adams 1958). Today, in the attempt to feed the world's burgeoning population of people, increasingly huge areas are being brought under irrigation in arid and semi-arid lands. As a result, the problems related to salinity have once again began to have overwhelming, detrimental effects on both traditional and modern agriculture and animal husbandry.

Since most irrigated lands lie in arid and semi-arid areas, salinization is not only one of the leading causes of desertification, but is also one of the most frustrating results of man's attempts to expand cultivation into these regions. The commonly sought solution of providing more water for arid lands in fraught with danger. For every effort to bring more land under cultivation with irrigation provided by the harnessing of rivers and the building of canals, an equivalent or greater amount of land is going out of production as a result of salinization of over-irrigated lands (White 1973).

In the fight against salinization, three basic approaches are available. First, improve drainage so that salt build-up is slowed or halted. This typically requires huge investments in sub-surface tiling, drainage wells, and tube wells, combined with frequent leaching of the upper soil layers. This engineering approach has been undertaken on a large scale in areas like western Pakistan and the Imperial Valley of California. Nevertheless saliniaztion is still increasing in such areas. Second, select or breed for greater tolerance in conventional crops showing some genetic variability for salt tolerance. e.g. wheat and barley (Epstein & Norlyn 1977, Kurian & Iyengar 1971); tomatoes (Tal 1971); or cotton and sugar beets (Ahmad & Abdullah 1981).

Plants for arid lands Royal Botanic Gardens Kew, 1985.

In G.E. Wickens, T.R. Goodin & D.V. Field (eds.) 1985. Plants For Arid lands. George Alkn and Umwin, London. Pp. 177-188.

A third and fundamentally different approach; start looking for potentially useful, wild halophytes. The last approach, which only began to attract attention in the past ten years, also raises the possibility of utilizing vast areas previously considered unsuitable for any sort of agriculture, such as natural salt flats, desert dunes, and coastal deserts. Over 32000 km of desert coasts and equally huge areas of sand dunes in interior deserts could theoretically be brought under cultivation with the right halophytes and appropriate new methods of agromanagement. Problems with these new systems will be numerous, yet in the long run halophytes may be the most widely applicable and significant of the three approaches to cultivating saline lands.

A comprehensive survey of the halophytic vascular plants of the world reveals that more than 1250 species of true halophytes in a least 100 families occur in saline coastal environments and desert interior (Aronson in preparation). Increasing attention has been paid to research and development on them since Hugo Boyko (1966, 1968) first proposed utilizing undiluted seawater for irrigation. Of course the fodder value of various halophytic chenopods, notably *Atriplex*, has been observed and exploited for quite some time. Yet it is only within the last ten years that the broader agronomic and economic potential of halophytes as a group has been recognized (Mudie 1974, Chapman 1975b, Somers 1975, O'Leary 1979, Felger 1979).

Most significantly, actual field screening trials of a wide variety of halophytes have been initiated in the past few years in several countries. These trials are not only helping establish criteria for selecting halophytes for specific purposes and regions, but are also increasing our understanding of how to manage them agriculturally (see O'Leary *et at.* 1984a, Pasternak *et al.* 1984a, Gallagher 1984). A great deal of new information is also being accumulated on the actual levels of salinity tolerated by different species and populations within species under controlled conditions, as well as the range of productivity and quality of plant products that can be obtained from cultivated or managed halophytes. We are also learning which halophytes adapt well when introduced and cultivated in environments such as coastal sand dunes irrigated with sea-water. Although a universally accepted definition of what is a halophyte has not yet been achieved, these large-scale screening trials suggest as a practical definition: a halophyte is any plant that can complete its life cycle and reproduce itself under conditions of soil-water salinity of 8-10 dS/mECe (approximately 20% seawater) or more. However, it should be noted that germination and early seeding survival under such saline conditions may be a much more restricted occurrence.

It remains to be seen which avenues of development and which halophytes will prove to be the most useful. The following, then, is intended to suggest the range of uses for which halophytes have been and are being used. Finally, I will attempt to indicate the most promising schemes for halophyte development and utilization in the future

PAST USES OF HALOPHYTES

Mangroves: multi-purpose tropical halophytes

Mangroves as a group have probably been put to the largest number of uses of any halophyte. An abundant source of timber, firewood and charcoal, as well as of tannin and many minor products, they have been exploited quite extensively in virtually all the tropical coastal regions and estuaries where they occur. Various authors define mangroves differently, but at least 50 tree and shrub species in 10 families and 14 genera are commonly accepted as mangroves, with a biogeographic centre in the Indo-Pacific region (Teas 1982) and one in northeast Australia (Mepham 1983a; 1983b). The numerically important families are the Rhizophoraceae. Avicenniaceae and Combretaceae; and the major economic genera of worldwide importance are Avicennia, Brugieria, Conocarpus, Heritiera, Laguncularia and Rhizophora.

As a result of overexploitation, formerly dense mangrove forests have been eliminated or greatly reduced in many areas such as West Africa, northwest India, and the Red Sea. In Indonesia, Malaysia and other areas, mangrove forests are still largely intact and in use. Chapman (1976) has given a detailed account of the utilization of various mangrove species.

The multi-purpose potential of mangroves under managed conditions should also be emphasized: besides the above products, many species have palatable foliage that can be a major source of animal feed. Indeed in many arid coastal areas where mangroves occur sporadically, but little additional vegetation is available, the foliage of such species as *Avicennia marina, Sonneratia alba* and *Rhizophora mangle* has served as camel and cattle feed (Chapman 1976); the leaves of the latter species have even been suggested as human food (Morton 1965). However, the high tannin content of mangrove leaves does present some problems. In Bhavnagar, India, Dr T. Kurian was investigating the integrated fuel and fodder potential of local *Avicennia marina* stands at the time of his unfortunate death in January 1984. Clearly, more work is needed in this area.

Saltbushes and other chenopods

Another group of halophytes important worldwide for forage and fodder in continental and coastal desert regions is the large group of Chenopodiaceae commonly called saltbushes. The most widespread and best known of these is *Atriplex*, with 245 species distributed in virtually all the world's arid and semi-arid regions (Osmond *et al.* 1980). Other important genera in the family are *Chenopodium, Kochia, Maireana, Salicornia, Salsola* and *Suaeda*. The potential for increasing and maintaining year-round fodder production in arid and saline regions, as well as in other drastically disturbed lands such as mine tailings, has long been recognized. Various attempts have been made for at least a century to systematically manage wild stands and increase their potential as well as to introduce new species, reseed depleted regions, and otherwise increase the fodder potential of traditional grazing lands. Most of this work has been carried out in Australia, the western USA, and Israel (Nelson 1904, Trumble 1932, Koller *et al.* 1958, Malcolm 1969). More recently, the rate of developmental research on *Atriplex* and related shrubs has accelerated and expanded to other countries. A major reason is the ability of many *Atriplex* species to not only survive but also produce exceptionally large quantities of biomass under extremely saline conditions. This and their high nutritional value to livestock make *Atriplex* and some related taxa among the most promising of all economic halophytes. More details of the current work on the group will be given in the last section.

Halophytes traditionally used for food

The only major food crop derived from a halophyte gene pool is the sugar beet. *Beta vulgaris*, a cultigen derived from and probably synonymous with the Euro-Siberian and Mediterranean *B. vulgaris* subsp. *maritima (=B. maritinna)*. Various races are grown as root or leaf crops in temperate zones of the Old and New Worlds, and major commercial breeding programs have been carried out for over a century to increase yields, improve disease resistance. etc. However, the natural salt tolerance of the wild progenitor has mostly been bred out of the commercial varieties.

Eelgrass and Palmer's saltgrass from the Gulf of California in North America are seed plants that grow in ocean water and have been used as major food staples (Felger & McRoy 1975). The seed of eelgrass, *Zostera marina*, was harvested by the Seri Indians each spring from the Sonoran coast of the Gulf, toasted, ground and prepared as a gruel. Usually the ground seed was mixed with sea turtle oil or fat or with the seed of the columnar cactus *Pachycereus pringlei*. The resulting mixture was very rich in protein, fats and carbohydrates (Felger *et al.* 1980). Similarly Palmer's saltgrass (*Distichlis palmeri*) was regularly collected by the Cocopa and other Yuman Indians who lived along the delta and lower Colorado River at the head of the Gulf of California. The tidal flats of the Colorado Delta once supported thousands of acres of this coarse perennial grass which were frequently inundated by tidal seawater. Its grain is similar in size to wheat (6.5 mm long), and was used by the Cocopa to make bread (Felger 1979). Dr N. Yensen of the Environmental Research Laboratory, University of Arizona has recently selected large-seeded lines of *Distichlis palmeri* which may be similar to the 'improved" strains that were apparently once managed by the Cocopa but are now thought to be extinct (Yensen *et al.* 1981, Felger & Mota-Urbina 1982).

Although the cultivated date palm, *Phoenix dactylifera*, is not a halophyte by the definition given above, there seems good evidence that it was domesticated from wild halophytic populations somewhere in the Middle East. Indeed the cultivated date can be irrigated with moderately brackish water without serious loss of yield.

Barilla

From the ashes of certain chenopodiaceous halophytes, particularly from *Arthrocnemum, Haloxylon, Salicornia, Salsola and Suaeda*, a carbonate of soda called barilla was at one time obtained in large quantities and exported for the soap and glass industries. In the 18th and 19th centuries, the major exporters of barilla were India and North Africa (Watt 1889), as well as the Camargue and adjacent regions of the Mediterranean littoral of France and Spain (Martinez 1983). To this day, *Suaeda fruticosa* and other chenopods are collected from the saline ranns of Rajasthan to make soap and baking soda for local use (Aronson 1982). Of course, sodium carbonate and bicarbonate are now manufactured commercially with the Solvay process.

Rushes

The stems of a number of Old and New World rushes have been used since ancient times for the manufacture of mats, baskets and cordage. Many species are significantly salt-tolerant, and much infraspecific variability in salt tolerance is known. In the early 1960's Hugo and Elizabeth Boyko initiated the development of a *Juncus*-based industry utilizing highly saline water in the Dead Sea Valley. Despite backing from the Israeli government, however, this project never came to fruition. In recent years, interest in *Juncus* has revived in Egypt and some other countries (Zahran *et al.* 1979).

Minor foods

The sea fennel, *Crithmum maritimum* is collected from wild populations in southern Italy and Greece used in salads (Franke 1982). This perennial umbellifer is widely distributed along the shores of the Mediterranean and the Black Seas, and along the western shoreline of Europe and Britain. The young leaves and shoots of *Batis maritima, Portulaca oleracea, Tetragonia tetragonoides, Salicornia* spp., and *Suaeda torreyana* have also all been used for salads and pickles in various parts of the world.

Salvadora oleoides and *S. persica* yield edible fruits rich in oil and fat. Both are multi-purpose trees in NW India, providing wood, shade, fodder as well as the fruits. The potential use of *Salvadora* fruits as the source of an industrial non-edible oil has also been reviewed (Gupta & & Saxena 1968).

At least one species of *Euterpe* grows in saline marshes in western South America and has been exploited for its edible palm heart (Strudwick pers. comm.).

Major current uses of halophytes

Major current uses of halophytes fall into three categories which are discussed below. Several other uses of selected species are, e.g. for minor food products, medicines, and so-called biological desalinization.

Fodder

As mentioned in the previous section, the fodder value of many halophytic and xerophytic chenopods has been exploited in arid and semi-arid regions for millenia. Within the past hundred years, however, major advances have been made through introduction, selection, proper range management, and new applications. Most of these species combine high biomass and high protein and mineral levels with outstanding adaptive ability to a wide range of environmental stresses. Considerable success has been achieved in Australia, North Africa, the Middle East, the Americas and elsewhere in cultivating chenopods, especially *Atriplex* species in areas subject to total summer drought or on badly salt-affected lands. The management and selection of *Atriplex* spp. is well documented and work to produce improved forms suiting local conditions in many countries is proceeding. Much must still be learned about the proper agromanagement and conditions necessary to maximize yields, and perhaps more important, palatability to livestock (Goodin 1979). Relatively soon, it may be economically feasible to cultivate *Atriplex* alone or in combination with other species with direct seawater irrigation and obtain fodder yields comparable to those of alfalfa grown on sweet water (Pasternak 1982).

Another taxon which has attracted much attention as a fodder plant on soil affected by salinity and water logging is Kalar grass, *Leptochloa fusca* (SEPASAT 1983). In India, Pakistan and elsewhere, this salt and alkali-tolerant grass has been utilized for fodder production on previously unproductive lands.

Land reclamation

Halophytes of agricultural or horticultural value are also being increasingly used for land reclamation. In the hypersaline Lago Texcoco northeast of Mexico City the saltgrass *Distichlis spicata* has been successfully introduced and irrigated with Mexico City sewage water to stabilize some 6000 ha of the lake bed. Forage for approximately four head of cattle per bectare for nine months annually is thereby produced, and more importantly, stabilization of the seasonally dry lake bed also helps reduce the dust storms that plague Mexico City each dry season (Urbina 1979 and unpublished).

Considerable interest also lies in various salt-tolerant species for revegetation and rehabilitation of surface mines or other drastically disturbed lands in arid and semi-arid regions. The USDA Soil Conservation Service has selected several species for use in the western United States (Thornburg 1982). The Australians have also made great progress.

In Kenya, various halophyte trees and shrubs, e.g. *Conocarpus lancifolius*, have been planted directly in seaside quarries to produce fuel and fodder from otherwise useless land (Rene Haller, pers, comm.).

One rather intriguing way of using halophytes in land reclamation is the production, from various species of *Plantago*, of a gum or glue used as a mulch binder to hold fibre and seed in place on steep slopes and sandy soils. Thus erosion from wind and rain can be eliminated or at least reduced until new vegetation is re-established (Hubbs Bros. 1982).

Landscaping

Many halophytes have been selected for amenity planting and landscaping in arid and semi-arid regions where saline or brakish water is available more readily or cheaply than fresh water. Several commercial enterprises in the USA and elsewhere specialize in offering such 'plants and seeds for adverse conditions' (Pecoff Bros. 1980, Kimberley Seeds 1980). In the southern part of Israel, salt-tolerant ornamentals have been used for gardening and landscaping for over two decades (Pasternak *et al.* 1984b).

Some of the outstanding species selected and disseminated by The Institutes for Applied Research, Israel are: trees: *Melaleuca halmaturorum, Eucalyptus sargentii, Tamarix* spp., *Conocarpus erectus:* shrubs: *Borrichea frutescens, Clerodendrum inerme, Maireana pyramidata, M. sedifolia, Scaevola* spp.: ground covers: *Crithmum maritimum, Galenia secunda, Drosanthemum floribundum, Halimione portulacoides, Limonium* spp.,*Phyla nodiflora, Sesuvium* spp. (Pasternak *et al.* 1977).

One exceptionally attractive halophyte widely used as an ornamental in southern Florida is the silver buttonwood, *Conocarpus erectus* var. *sericeus*, which is a naturally occurring silvery-grey form of the widespread tree or shrub of the mangrove transition zone of south Florida, the West Indies and West Africa (Workman 1980).

The future of economic halophytes

Over the past 30 years research on halophytes has proceeded rapidly from the initial stage of observation that wild halophytes survive and reproduce under conditions of high salinity, through the stage of proposing ways of using halophytes economically, and on to the final stage of testing the economic practicality of various innovative applications of halophytes. Several promising avenues of research and development on halophytes are now continuing in various institutions, and these will no doubt lead to other, as yet unsuspected, possibilities. Four of the more exciting current developmental research efforts are mentioned below.

Fodder

The choice, management, and breeding of vigorous, high-yielding palatable fodder shrubs is becoming more sophisticated (Stutz *et al.* 1975, Stutz 1982, Pasternak 1982, Aronson & Forti 1983). The leading candidate species at this time are *Atriplex barclayana, A. canescens, A. halimus* and *A. nummularia.* New efforts are being made to assemble large germplasm banks of these highly variable taxa to allow for selection and breeding for the desired traits. Since all four species produce plentiful nutritious fodder under adverse conditions, major new applications and large-scale plantings should be undertaken on one or more of them soon.

Fuel

Despite a huge and growing literature on biomass production for fuel in arid lands, the prevailing opinion seems to be that it is still uneconomical to grow any crop anywhere for biomass alone. I contend that irrigation of selected halophytes with cheaply available seawater or other highly saline water unsuitable for any other use may be the exception. Some woody species of *Atriplex*, e.g. *A. lentiformis*, may be suitable for rapid production of kindling and medium-sized firewood with seawater irrigation.

Certain salt-tolerant trees such as *Casuarina, Tamarix*, some *Prosopis* species and even one species of *Eucalyptus* could theoretically be grown for fuel with saline water. In many cases, the multi-purpose use of such biomass species could improve their economic viability, *Atriplex lentiformis*, for example, also yields large quantities of foliage for fodder: *Prosopis* and other salt-tolerant legumes yield copious amounts of edible pods in addition to their high quality wood (Felker *et al.* 1981). Mangroves of course represent a wealth of valuable wood and multi-purpose crop candidates whose potential for development remains to be fully recognized. In addition the mangrove associate nipa palm, *Nypa fruticans*, appears to be a very promising source of fuel alcohol in tropical countries such as Malaysia, New Guinea and the Philippines (Mercer & Hamilton 1984).

Breeding for increased salt tolerance

The possibility of incorporating significantly greater salt tolerance into certain conventional cereal, vegetable and fodder crops by the use of wild halophytic relatives should gain greater attention in the future. With wheat, barley, tomatoes, cotton, melons, beans, aubergines and several others, this approach has already begun to be recognized and applied (Epstein *et al.* 1980).

Oilseeds

The main cause for the low palatability of halophytes used for fodder is the accumulation of salts in the vegetative tissues. Significantly, the seeds of these same plants usually have salt levels below 10 per cent by dry weight (O'Leary *et al.* 1984). Often the nutritional value of halophyte seed oils is as high or higher than that of conventional seed oils, and they could perhaps be used by various food industries. Some leading candidates for further investigation are the salt grasses *Distichlis* and the closely related *Jouvea*, and the chenopods *Allenrolfea occidentalis, Salicornia europea, Suaeda fruticosa* and *S. torreyana.* In all these cases, the multi-purpose potential is great.

CONCLUSION

Increased utilization of halophytes in arid and semi-arid regions seems very likely in the near future. Both the rapidly escalating problems of desertification and salinization and the failure of traditional efforts to obtain water of the quality required by conventional crops in these areas favor this conclusion. However, without adequate funding, both regional and international research and development efforts on economic halophytes and novel systems incorporating them will be unnecessarily delayed.

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Mr. **Scheuer**. Thank you, Dr. Aronson, for extremely interesting testimony.

Now we will hear from Peter Freeman, consulting geographer.

STATEMENT OF PETER FREEMAN, CONSULTING GEOGRAPHER

Mr. **Freeman**. Thank you, Mr. Chairman. Thank you for this opportunity to testify on this important topic.

I am a consulting geographer, but I also have a master's degree in tropical agriculture and forestry from CATIE in Turrialba, Costa Rica. I have been working for 22 years in developing countries in the problems of natural resources management, environmental regeneration and management, in the context of rural development.

For the last 10 years, I have been working largely on questions of Africa and especially in the Sahel. For 2 years, I was the environmental advisor to the AID mission in Senegal, where I designed a program for land regeneration in the Groundnut basin of Senegal.

Recently I prepared a program document for IUCN, the International Union for the Conservation of Nature and Natural Resources, aimed at giving them the basis for planning and executing actions in drought-stricken Africa to regenerate the environment and achieve ecological stabilization. I would like to speak to some of the highlights of that report.

An executive summary of that report is being sent to me, a revised version, and I will make it available to the subcommittee.

Let me say the technologies appropriate to food production in Africa must deal with many matters, but there are four that stand out in my mind: First, the extreme heat, aridity, and rainfall variability that affect much of Africa. The second would be the fact that agriculture is, by and large, done on a small scale, at a subsistence level, and in very densely populated areas, increasingly so.

In the Sahel, for instance, there are populations of up to 100 people per square kilometer in areas of 300 millimeters of rainfall or less. In well-watered areas of Kenya and Rwanda, populations reach 400 and 500 people per square kilometer; that is less than two-tenths hectare per person.

A third characteristic that we have to deal with is the fact that rural environments in Africa are degrading because of overpopulation, because of the obsolescence of shifting, agriculture, and the fallow system that is no longer working.

And finally, we are dealing with generally ineffective government services, poorly organized government services, especially related to rural development, but very strong village organizations, usually.

Now, there are food production technologies that successfully address these constraints and these issues. Many of them have been implemented by private voluntary organizations, and there are some success stories that you may know of already. I can cite a few.

For instance, CARE has successfully worked on a windbreak project in Majia valley in Niger which has increased food production by 23 percent; in this case, it was sorghum. This is dryland agriculture.

Mr. **Scheuer**. I am having trouble hearing you.

Mr. **Freeman**. I am sorry.

CARE, a private volunteer organization, has successfully planted some over 200 kilometers of windbreaks in the Majia valley in Niger that have caused food production to increase by about 23 percent.

An OXFAM fieldworker in Burkina Faso has successfully introduced techniques of soil erosion that have both harvested water and increased crop production.

In Chad, an AFRICARE project that was instituted 10 years ago has created stands of acacia albida, a remarkable tree that can be planted within crop fields, within cereal fields, and remain there because it loses its leaves in the rainy season, as opposed to all other trees in nature, which usually flush out their leaves in the rainy season. This tree, on losing its leaves, creates a green mulch that the millet crop uses up right away.

There are other examples of food-enhancing or food-producing technologies that have been developed by AID and international organizations, but many of the more successful appropriate technologies have been on the small scale by PVO's.

Now, there are more complex but appropriate technologies that we have to look at in addition to some that have been mentioned here. I would like to mention agrometeorological forecasting as a means of planning agronomic—that is to say crop and soil husbandry—practices that effectively deal with rainfall shortages and the erratic nature of rainfall.

There have been two examples I can think of that have dealt with the erratic nature of rainfall in Africa, one in Kenya, carried out under AID auspices, and another in Mali on a pilot project carried out under the World Meteorological Organization auspices. All of these are dealt with in some detail in the document that I am sending to you.

I would like to say in closing that the techniques of environmental regeneration, land regeneration, in Africa are, by and large, the same techniques used to intensify food production. They are not mutually exclusive. Therefore, I think that agriculture production projects can be, at one and the same time, environmental regeneration projects. We can think of these things as being one and the same thing.

Certainly, we cannot have stable or sustainable agricultural production in Africa without taking care of the productivity of the environmental resources that support agriculture.

Thank you.

[The prepared statement of Mr. Freeman follows:]

Statement by Peter H. Freeman

to the House Committee on Science and Technology
Subcommittee on Natural Resources, Agricultural Research and Environment

Oct. 30, 1985 hearings on Hunger in Africa

Mr. Chairman, members of the Subcommittee, I welcome the opportunity to testify on a matter of such great importance.

There is a crisis in agricultural development and in food production in Africa that I have personally witnessed, and which exceeds anything I have seen in my twenty-two years of work in the Third World. I have worked with the Organization of American States, the World Bank, the Smithsonian Institution, the Conservation Foundation and the Agency for International Development. During the past ten years I have worked primarily in the African Sahel, in agricultural development planning, reforestation management, and the design of land regeneration. During 1981-83, I was Environmental Advisor to the AID mission in Senegal.

Much of my experience is contained in a review of development and research approaches to the long term environmental rehabilitation of drought-stricken Africa that I prepared for the International Union for the Conservation of Nature and Natural Resources(IUCN). The Subcommittee will soon receive from IUCN the Executive Summary of this document.

To be appropriate, food production technologies in Africa must realistically deal with several conditions:

*Climatic extremes of heat, aridity and erratic rainfall.

*Environmental degradation: deforestation, erosion, soil impoverishment.

*An agriculture predominantly of subsistence....small scale, traditional techniques, not innovative, but adapted to the many different environments.

*Strong village organization but weak governmental organization, especially rural services.

Although high-yielding varieties suited to African dryland farming are still to be developed, there are food production technologies, both traditional and improved, that successfully address the above conditions. Examples are windbreaks in Niger's Majjia Valley that have increased yields by 23%; soil-enhancing Acacia albida trees in Chad, Niger and Senegal that can double millet yields; erosion control ditches and water harvesting in Burkina Faso; regeneration of wooded range in Niger by encouraging termite colonization of compacted soils; and improved agroforestry methods in Rwanda.

Private voluntary organizations such as CARE and OXFAM have been especially effective in the introduction of simple techniques through village scale projects. There is tremendous scope for additional work and AID should foster the diffusion by PVO's of known and effective production or conservation techniques. They should also be routinely included in agricultural production projects supported by AID.

New, more complex technologies appropriate to African agriculture are being developed, but progress has been slow relative to the need. New crop and soil management techniques are sorely needed to maintain agroecosystem productivity in place of the traditional fallowing method, now ineffective because of population growth. Chemical fertilizers, even if affordable, are not sufficient and can even be harmful, especially in the sandy soils found so extensively in the Sahel. In these soils organic matter is the key to fertility; without it fertilizers are largely ineffective. Ways must be found to manage the total biomass -- crops, trees, bushes -- so as to feed the soil as well as people and their livestock. Soil water conservation techniques are equally important, e.g. windbreaks, post-harvest plowing(Sahel and Sudanian belts), and water harvesting.

There are other more complex technologies that hold promise. One is agrometeorological forecasting. It has been successfully used to schedule operations such as planting, weeding and thinning, as well as to determine seed density and fertilizer dosages so as to minimize drought damage. The World Meteorological Organization and AID have supported research and pilot projects in Kenya and Mali, but use of this tool is still an exception. A second example is the purposeful introduction of the floating water weed Azolla pinnata in flooded rice fields. A nitrogen-fixing alga living symbiotically in the leaf of this beneficial plant can supply the equivalent of many kilograms of nitrogen fertilizer. Although its agronomic use is commonplace in Asia, this technique has not yet gotten out of West African research stations(which have confirmed the efficacy and feasibility for Africa of this soil-enhancing method).

Much greater support and research and development effort is needed for such technologies that increase food production through management of soil, water and vegetation in the agroecosystem. There is a temptation, however, to put all the R and D eggs in the high yield variety basket.

Lastly, I am convinced that agricultural development in Africa can succeed only if it squarely addresses the problem of environmental degradation. Further, agricultural development and environmental restoration must be one and the same. Efforts to restore the environment will fail unless they bring benefits to the farmer. In essence, agricultural development in Africa must pursue the mutually dependent goals of increasing food production and restoring, or conserving, agroecosystem productivity.

I would be happy to elaborate on any of these points with supplementary materials or explanations. The IUCN report summary that you will receive contains information on the above as well.

I wish the Subcommittee success in the quest for ways to help alleviate hunger in Africa.

EXECUTIVE SUMMARY OF VOL. 1

In May 1985, IUCN's Council set up an international Task Force on environmental rehabilitation in the Sahel and other drought-affected regions of Africa, to prepare a Strategy and Action Plan. "Sahel" here refers to the sub-Saharan climatic belt from Senegal to Somalia. The Task Force report, called for convenience the **Sahel Report**, comprises Vol. 1: **Strategy and Action Plan**, and Vol. 2: **Analysis**.

1. BACKGROUND

The main preceding events were:

- November 1984: IUCN's Madrid General Assembly, concerned that the effects of the drought in the Sahel and the Horn of Africa had revealed the dramatically declining ability of the natural ecosystems of these areas to sustain life of all kinds, requested the Director General to support pilot conservation projects in arid lands, and national conservation strategies and plans (Resolution 16/7 1 (c) and (e).
- January-March 1985: IUCN's Conservation for Development Centre (CDC) prepared a consultant report on Desertification in the Sahel, to form a basis for cooperation with relief-oriented NGOs. The report was revised for consideration by IUCN's Council.
- May 1985: IUCN's Council, commending the initiative, referred further development of the report to a Task Force chaired by Dr Walter Lusigi, Regional Councillor for Africa, and Director of the Kenya Arid Lands Research Station at Marsabit, with CDC as secretariat;
- July 1985: a 23-member Task Force was constituted;
- August 25-31 1985: 20 members of the Task Force drafted the report at a workshop at Naivasha, Kenya;
- September-October 1985: the secretariat incorporated further comments and finalized the report to Council.

2. STRATEGY

In the drought-affected regions of Africa, human livelihood security and environmental rehabilitation are inextricably linked. A dual strategy approach is required, to promote ecodevelopment at the local level and to address national, regional and international causes of environmental degradation.

2.1 A major network of small ecodevelopment projects

In conserving the environment, the contribution of local knowledge and local institutions is required to identify problems and solutions which are highly site-specific, and to promote local communities as managers of the environment on which they depend. IUCN will provide scientific, technical and professional support to promote a massive network of many small ecodevelopment projects, designed in close consultation with local people, and incorporating local and national NGOs. These will develop community management of natural resources for sustainable development, will address human and environmental issues simultaneously, and will link ecological security with livelihood security.

2.2 The development context and wider issues

For environmental rehabilitation through ecodevelopment to succeed, the wider causes of environmental degradation must also be addressed. This requires reexamination of national, regional and international development policies across a broad range of sectors such as energy, agriculture, transport, pricing and fiscal policies. These and other factors affect demography, land-use and the way rural people relate to the environment. Such a review must be coordinated closely with all interested agencies.

3. ACTION

IUCN will undertake three types of action:

- actions on its own account
- actions in collaboration with partner institutions
- consultative services to institutions which request them.

The proposed actions follow the two-pronged strategic approach. They will be taken simultaneously at several different levels.

- At the local level, IUCN will analyse ecodevelopment successes and failures, identify potential projects and partners, promote project design, assist to mobilize resources, monitor, evaluate, and disseminate information;

- at the national and regional levels IUCN will promote national conservation strategies supported by reviews of expertise and the environment, and priority projects.

IUCN will also review, with intergovernmental and nongovernmental development and relief agencies, practical ways to promote environmental rehabilitation for the benefit of rural people.

IUCN, able to operate from local to international levels, brings together in a common, non-political forum intergovernmental, governmental and non-governmental representatives, politicians and planners, social and natural scientists, thinkers and doers, and developing and industrialized country representatives.

The following tasks will serve as a basis for IUCN's Action Plan:

3.1 Ecodevelopment projects

Combining IUCN's general scientific expertise with the highly site-specific knowledge of local communities, projects will be designed locally, to depend as far as possible on local human and organizational resources. IUCN will help to bring together human, technical and financial resources using its own expertise, networks and organizational facilities as a catalyst.

3.1.1 Local projects to link environmental rehabilitation with rural livelihood security. IUCN will develop a series of brief national and regional surveys of existing project documentation. With national authorities, development and relief agencies, it will identify suitable local institutions and sites for ecodevelopment projects. This will be done through consultant missions, surveys by local consultants, and local workshops. IUCN will assist local institutions to develop scientifically- and economically- sound ecodevelopment projects to link environmental rehabilitation and management with livelihood security. A main target will be to help existing specific-issue projects, such as those for improved stoves or tree- planting, to develop an integrated ecodevelopment approach.

3.1.2 Local and national capabilities. IUCN will support local and national institutions seeking to develop their capacity to implement ecodevelopment projects, and to continue them autonomously. This will include assisting communities to define their needs, to share and develop existing appropriate technology, and where appropriate to use or rehabilitate traditional production systems and common property resource management institutions. Actions will include training workshops and seminars, translation and dissemination of simply-presented ecodevelopment information for project implementation (ecodevelopment information service), and matching research activities and solutions to local questions and problems.

3.1.3 **Advisory and monitoring services.** IUCN will develop its advisory and monitoring capacity on the environment and on ecodevelopment projects, and support national and regional capacity to collect, analyse and disseminate such information, particularly to the local level. Successful projects and techniques in particular must be widely reported. IUCN will develop advisory services to organizations wishing to commit resources to environmental rehabilitation.

3.1.4 **External publicity and information.** IUCN will develop international, high-quality presentations on successful ecodevelopment and environmental rehabilitation projects, including an existing audiovisual presentation to stress what people are doing for themselves, with some outside assistance.

3.2 Policy reorientation

Certain wider questions must also be addressed. The successful rehabilitation of rural environments requires appropriate land-use policies, national and international terms of trade, conditions of civil security and national and international styles of development.

3.2.1 **Implementing the World Conservation Strategy (WCS).** IUCN will continue to analyse those obstacles to sustainable development and strategic responses, which have yet to receive full treatment in the WCS. This is the main purpose of the May 1986 Ottawa Conference.

3.2.2 **National Conservation Strategies (NCSs).** IUCN will work with national governments to integrate conservation and environmental rehabilitation into national development policy. IUCN has a proven capacity to develop NCSs, coordinating with other organizations and with existing action plans. Preparatory work will involve updating country environmental profiles, preparing natural resource expertise profiles, conducting consultations with other organizations including CILSS/Club du Sahel, Unesco, FAO, UNSO, and UNEP, and determining through high-level country missions, for which preparations are in hand, the wishes and requirements of the countries concerned.

3.2.3 **Links with partner organizations.** IUCN will establish new links with intergovernmental and non-governmental organizations to address in practical ways obstacles to conservation arising from the international development process.

3.2.4 **Larger projects.** IUCN has a historic mission to preserve ecosystems on a larger scale and will continue existing and new major long-term conservation projects such as those in Air-Tenere (Niger) and the Niger Inland Delta (Mali).

3.3 Mobilizing human resources

IUCN will develop its national inventories of environmental expertise to promote the effective use of local and national resources for ecodevelopment and environmental management; and will assist in mobilizing regionally and internationally such additional expertise as may be needed.

3.4 Mobilizing financial resources

3.4.1 **Matching funds with projects.** IUCN will:

- identify financial resources for enviromental rehabilitation
- assist organizations to develop proposals
- assist in matching projects with funds
- assist in monitoring, evaluating and disseminating results particularly of succesful projects.

3.4.2 **Influencing development spending.** IUCN will work with leading development assistance organizations, and assist them on request to review their programmes in order to ensure that development financing takes the need for environmental rehabilitation fully into account.

3.5 Mobilizing IUCN's resources

All of IUCN's constituent commissions and centres have a role to play in the above plan of action, and can bring to bear a wide range of scientific expertise as well as a wide range of connexions with national governments, national and international NGOs, bilateral and multilateral agencies.

3.6 Future role of the Task Force

The Task Force should continue as a monitoring, review and "scouting" group, and advise the Director General.

VOLUME 2: ANALYSIS

EXECUTIVE SUMMARY

1. INTRODUCTION

The second Volume of the Sahel Report analyses environmental degradation and rehabilitation to support the Strategy and Action Plan of Vol. 1. Appendices, not summarized, present more detail.

2. ENVONMENTAL DEGRADATION

1.1 Nature and processes of environmental degradation

Environmental degradation ("desertification") is distinguished from cyclical successional change. Exploiting any ecosystem can cause changes to become linear. Rehabilitation is possible with time, resources and reduced exploitation, but is harder as thresholds are crossed. In dry zones loss of the herb layer is critical, even when reduced competition favours tree growth.

2.2 The Sahel and the Sudanian zone

The climatic Sahel belt across Africa between the 100 and 800 mm isohyets, ranges from the northern rangelands of nomadic or transhumant pastoralists, through progressively humid zones under millet and sorghum with livestock, merging into the Sudanian zone. Most people are agricultural, in the moister Sudano-Sahelian zone.

2.3 Drought

Climatic drought is subnormal rainfall. The Sahel has a drought by this century's standards, particularly after the highs of the 1950s and 1960s which are often mistakenly seen as "normal". It may be aggravated by widespread devegetation. Rainfall is very variable, and drought cannot be predicted or controlled. But it can and should be planned for. The entire Sahelian-savanna belt is subject to chronic major drought and food insecurity.

But "drought" is a relative concept implying rainfall insufficient to support human and animal populations. A rise in animal population is equivalent to a decrease in rainfall. Drought has revealed, not caused, ecological imbalance, environmental degradation and mismanagement.

2.4 The role of man in the modification of environmental systems

Man has modified the environment by fire, deforestation, agricultural and pastoral expansion, and new settlements, has reduced biological diversity and productivity and caused serious breakdowns in essential ecological processes. Many plants and animals have been lost that formerly supported ecological processes, and provided food particularly in times of famine. These imbalances have been exposed by recent droughts.

2.5 Agriculture, food, fuel and carrying capacity

While animal carrying capacity is rather inflexible, that for humans varies with type of exploitation, inputs, technology, ecological change, and cultural perceptions of what ecological change is acceptable. Unless ecological degradation is arrested, carrying capacities will decline further. FAO and World Bank carrying capacity studies have produced different findings. FAO found an excess of population over food production at present ("low") levels of inputs, and predicted marked improvement with intermediate and high inputs. For the World Bank fuelwood, not food, was the limiting factor. This insight is important even if global figures and assumptions are in doubt. Often rural populations are sustained at double the computed maximum. Agroecology shows how this can be done other than by mechanization, chemicals and genetic engineering.

2.6 Livestock carrying capacity

While traditional systems of livestock management were generally well adjusted to local ecological conditions, now much rangeland is severely deteriorated. The pastoral system is now seldom sufficient to the demands on it. While animal numbers rose greatly from the 1950s, agricultural expansion and degradation have claimed former pastures and intensified grazing disputes. The reduced productivity and carrying capacity of the browse and grazing resource are now in danger of being permanently impaired.

2.7 The crisis in Sahelian resource management

The crisis in resources is part of a larger process by which local mechanisms to manage resources in good and bad years have been eroded by events far beyond their control. In recent droughts the rural population has been impoverished and forced to short-term expedients. Environmental management has low priority. To restore sustainable land use, rural economies must be better buffered against outside forces. No simple technical solutions will radically transform productivity, which compares well with that elsewhere. Flexible livestock and pasture management is the best way to convert seasonal biomass into economic products.

2.8 Historical perspective

The present structural crisis, precipitated by drought, must be seen in wider context. The colonial era distorted African economies to supply raw materials, inhibited industrial development and undermined indigenous industry, removing many mechanisms which had helped control pressure on environmental resources. Pastoralists' land rights were often denied, their economy undermined, their services cut in economy measures. In some places expatriate settlement and plantation agriculture put increasing pressure on marginal areas for food production. National policies often follow colonial ones, reinforced by a combination of internal and external factors.

2.9 Styles of development

Internationally, the ineluctable (for Africans) deterioration of the terms of trade, increasing external debt and limits to external markets weigh indirectly on the environment. Some development styles and sectoral policies have undermined food production, food security and environmental management. In agriculture, rural areas have lost initiative, and the best land has been converted to cash crop monoculture. As terms of trade worsen, countries must continually increase agricultural exports. Livestock and forestry sectors reveal an imbalance between the use and sustainability of the ecosystems. Little effort is made to conserve fisheries. Energy and water go to to rich urban users or irrigation projects, leaving the poor to rely on fuelwood. Industry and mining look to exports or urban consumption instead of providing cheap agricultural inputs. This puts pressure on farmers and pastoralists to overexploit soil and vegetation, and to make insufficient use of other resources.

2.10 Demographic and social factors

Existing development styles also also promote a demographic imbalance, rural exodus and exponential urban growth. Increasing population is putting pressure on ecological resources, but demographic data are poor and unreliable, the rates of increase are uncertain, the mechanisms complex, and there is no simple correlation between population and the state of the environment.

Demographic structure and power are important. Women and children, predominant in rural areas, have little power over rural development, although women are the major food producers, fuelwood collectors and users. Development planning is an urban, male, bureaucratic and technocratic activity by those who do not depend immediately on the environment for their security. The results are short-term objectives for development, neglect of ecological imperatives, neglect of local environmental knowledge in project planning, growth of the absolute poor in rural areas, and increase of environmental refugees. But new land is increasingly scarce, and resettlement an expensive and inadequate remedy. Management solutions must be found in_situ.

2.11 Conclusion: drought, poverty, famine and environmental degradation

Drought has not caused the problems, but revealed them. Rural economies have been weakened and impoverished, resulting in, and from, environmental degradation. Famine is not the result of too many people, or too little food, but derives from a complex process of food entitlement. In Africa, famine areas are often those which have known a decade or more of civil/military insecurity and acute poverty. The overall problem is complex, and combines many factors. Solutions will not be easy, but the next section tries to show the grounds for hope.

3. ENVIRONMENTAL REHABILITATION

3.1 Environmental rehabilitation

Environmental rehabilitation is the process whereby degradation is arrested and reversed. It requires human intervention to reduce exploitation and allow natural regeneration. Environmental management can be improved, and species and life-support systems restored. Positive action is also needed to correct the causes of overexploitation, since the alternative--deliberately reducing the human and animal population--is unfeasible. Action is needed from the local to the international level, combining with development efforts and livelihood security.

3.2 Ecodevelopment projects: agriculture

Central to agricultural rehabilitation is the management of the cycle of organic nutrients. A combination of incremental improvements to traditional farming techniques can restore soil fertility and improve food productivity given minimum rainfall. Each technique has been separately proved in field projects: management of the vegetative biomass, reforestation, particularly with valuable indigenous species, simple soil conservation structures, water harvesting and conservation, live windbreaks, intercropping, drought-resistant strains, agrometeorology and early warning systems, diversifying and economizing on energy, particularly woodfuel, improved wood-free architecture, improved stoves, animal traction, communally managed forestry and rural health schemes. Rural communities can be environmental managers, through common property resource management systems.

3.3 Livestock and rangeland

There is no single package for livestock and rangeland management and there have been many failures and perverse results. Promising techniques include: improved marketing and prices for livestock combined with inputs, reduction of young animal mortality through better nutrition, low input disease control strategies, dispersed watering points, early warning systems of rangeland nutrition especially through vegetation monitoring, long-term indigenous breeding improvement, better integration with agriculturists, diversification to reduce risk, preservation of wild food resources, mobile extension agents. It will be critical to arrest the cycle of impoverishment, and restore to communities power to manage forests and rangeland responsibly. Where appropriate wildlife harvesting shows promise it should be promoted.

3.4 Ecosystem management and conservation

Two major IUCN projects are under way in Mali and Niger to better conserve and manage natural ecosystems. Further major projects are being proposed on important wetlands. Meanwhile major spontaneous resettlement is taking place in the moister Sudano-Guinean and Guinean zones. Governments may well be attracted by the possibility of large-scale trypanosomiasis and onchocerciasis control to open up large new areas for settlement. In this case long-term environmental interests must be maintained in conserving sufficient stretches of the Sudano-Guinean forest, which is rapidly becoming degraded. Reforestation and recolonization by locally extinct grasses and shrubs require refugia, whose value has already been demonstrated by the church land forests of the Ethiopian Orthodox Church.

3.5 National conservation strategies

Many areas of government policy indirectly influence land use, including policy areas not normally associated with environmental matters. Major revisions in national policies are now being undertaken as a response to the present world recession, the deteriorating macroeconomic situation, and the efforts under way with major donors to restructure agriculture. This provides an opportunity to introduce environmentally-positive or neutral policies.

3.6 International context

International efforts to combat desertification have not met with much success. There is a growing awareness in international circles that the poorer countries of sub-Saharan Africa are caught in a poverty trap. There is a widespread questioning of past patterns of international development and relations. The need to establish a broadly-based development in place of monocultural agricultural exports, is widely accepted. At the same time, development assistance communities such as the EEC/ACP have written environmental concerns explicitly throughout their development assistance agreement. An important opportunity exists to develop and harmonize these trends and to promote a just international economic order which will help to replace environmental destruction with conservation and rehabilitation.

3.7 Environmental rehabilitation and relief

Environmental degradation is directly connected to poverty, and poverty to famine. Food aid does not bring food security, which rests on eliminating poverty, and on restoring environmental productivity. This includes the rich range of wild emergency food resources which are now rapidly disappearing. Relief also must temporarily include fuel and fodder, to take pressure off the environment.

3.8 Basis for a strategy

The goal must be the rehabilitation of degraded environments, and the immediate method the strengthening of the ability of rural communities to manage the environment on which they depend. numerous techniques exist to do this, but it will be necessary also to work toward certain changes at the national and international levels in order to reverse the trends which are impoverishing countries, and particularly the populations in the drier rural areas. IUCN has the ability to bring together a number of different actors at different levels to assist in this process.

Mr. **Scheuer**. Thank you very much.

I have to disappear for a few moments. I am going to turn the chair over to my distinguished colleague, Claudine Schneider.

Miss **Schneider**. Mr. Chairman, it just occurred to me that before you leave I might pick up on a point that Dr. Aronson made, which is a point that I have made to you, and I am glad that he reinforced it. We did not collaborate in advance.

It seems to me that tomorrow we are having our last hearing on elements that contribute to the problems of hunger in Africa, and I am very anxious to hold a hearing specifically addressing the question of energy, because we have an energy subcommittee here on Science and Technology.

I think that you pointed out for the record the role that trees play in providing energy, and I would like to put in a second request, if I may, that maybe at some point in the future we might be able to hold a hearing specifically focusing on energy and energy transfer.

Mr. **Scheuer**. Yes, tomorrow isn't the last hearing.

Miss **Schneider**. No?

Mr. **Scheuer**. No, it is the fifth hearing.

Miss **Schneider**. Oh, OK. [Laughter.]

Mr. **Scheuer**. Its an open-ended set of hearings on hunger in Africa, and we expect to stick to this issue on a continuing basis.

Miss **Schneider**. Right.

Mr. **Scheuer**. I really mean that. Make sure that the kinds of approaches that we have heard here this morning on the first panel and this panel are cranked into our foreign policy and our aid programs.

Miss **Schneider** [as acting Chair]. Thank you, Mr. Chairman.

We are looking for solutions to the problems here. That is the reason that we are holding these hearings. And we are looking for some specifics as to how we can retrofit the AID and World Bank Programs so that we are more assured that the moneys that we are giving, No. 1, are in the best interests of the taxpayers, and those dollars are being used wisely, but second, that those who are the recipients of our financial resources are really getting the money and the information and the technology in the way that is most useful to them, and I think that you gentlemen have each provided us with some insights as to how things are being done in Africa and how they could be better done.

I wonder if I can just throw a broad question open to all of you, and that is, what are some of the things that our AID and World Bank giving programs are doing that are incorrect? What are some of the mistakes that we have made? This is an effort to correct some of those mistakes. We have a couple of pieces of legislation that we are thinking about, but we want to make sure we are doing the right thing. Can you give us a few examples of some of the errors? Anyone who is willing?

Mr. **Meisel**. Well, since my organization is funded by AID, I am not about to bite the hand that feeds me. [Laughter.]

So I think I will pass on that one.

Miss **Schneider**. This is called constructive criticism, however, so if you are not willing to do it on the record, maybe we can get some other information. But we don't want to draft legislation that, No.

1, is either unworkable or, No. 2, insensitive to the needs that need to be developed, and I think we hear a lot about the problems but not enough about how those mistakes could have been avoided. So this is positive information we are really looking for.

Dr. Aronson, do you have any strings attached to your money, or can you give us some comments?

Mr. ARONSON. Well, I am enjoying support from AID as well, and as I indicated earlier, I have a lot of praise for new thoughts and new directions that are emerging in AID. I would only try to reinforce some of the newly emerging directions there that would keep an open eye to new crop possibilities.

If home gardens is a stepchild in funding agencies, the concept of new crops has been something of a whipping boy for the past 30 years. I think that is beginning to change now, and I would like to think that a better awareness will develop in the appropriate offices and circles of the importance of understanding that new crops are needed in Africa and elsewhere in the Third World simply because we are dealing with different kinds of environments than those in which agricultural research has taken place over the past 200 years. It has only been in the last 25 years that people have really seriously focused attention on improving agriculture in the tropics.

I would like to also make a point here that, in my view, an opportunity exists to broaden our thinking—and I include AID in this—to include the wet tropics and the dry tropics in one thought. It is not an easy feat, but if you will allow the thought, I would say that the moist tropical rainforests, which are under tremendous threat of disappearing from the face of the planet in the next 20 to 30 years through mismanagement and through misconceptions about how to get the most out of those ecosystems; and, on the other hand, dry tropical savannahs, grasslands and deserts which are in the process of becoming more desertic and more unhospitable to man and his activities; these two kinds of areas, although superficially different in the extreme, share a great deal in common that should be recognized by development agencies.

This is in three main areas. One is that in such tropical environments, we need to think of a proper ratio between cultivated area to preserved area surrounding the cultivated fields. In the rainforests, this is self-evident. Indigenous peoples in rain forests throughout the world have shown that in order to get sustainable production from a 100-hectare bit of forest, they only farm 20 to 30 hectares at any given time, and they move around and rotate.

This is actually where the slash and burn type of agriculture Dr. Brady was referring to is in practice. In the dry parts of the world, in my view, slash and burn agriculture has never been practiced because wood is too valuable to burn off just to clear land. People don't burn wood to clear fields in Africa; they harvest the wood and they create larger and more invidious deserts around their fields through mismanagement of the environment.

If we could think in terms of tiered agricultural systems in the dry areas that would incorporate a ratio of cultivated to noncultivated portions, we could begin to reach more sustainable systems and protect the wild genetic resources that may provide the new crops of the 21st century.

The second point that seems to me to be commonly held to appropriate systems for wet tropical zones and dry tropical zones is the concept of agroforestry, the idea of mixing different kinds of crops that have different requirements, different seasonality and so forth, in the same fields.

And third is the idea that soils must be treated in different ways in tropical areas than in temperate areas, and this requires changes in our thinking about irrigation and about water in general.

I tried to raise briefly the issue of water harvesting or runoff agriculture previously. This is an ancient system that uses natural runoff during the rainy seasons and does not seek to apply water during the rest of the year. Independently discovered in many parts of the world, this is a system that incorporates ecologically appropriate methods.

So my final point would be that if we are working in Third World countries and attempting to transfer technologies or teach or train, what have you, we should go in with open minds as well and be alive to the fact that we might be able to learn much more that we are teaching in some of these areas, and our transfer attempts might be more a case of transferring something effective that the Somalis have developed, for example, to West Africa, rather than always trying to transfer from Cornell and U.C. Davis to Somalia and West Africa.

Miss SCHNEIDER. Very fine.

Mr. Meisel, if you could give us a short——

Mr. MEISEL. Yes, I have had a chance to collect my thoughts while Dr. Aronson was making his very trenchant remarks.

You know, it is easy to make AID the whipping boy or the Bank a whipping boy. But sometimes they simply don't have the resources to do what they need to do, and I think that, if I can just turn the question around for a moment, nutrition is one of the primary concerns in Africa. Yet as far as I know, there is only one nutrition officer in all of Africa, maybe two, in all of the 50-odd countries that there are in Africa.

Now, that is not because AID doesn't recognize the importance of nutrition. It is because they don't have the funds to have sufficient numbers of people. Or let me give another example.

Often the best development projects in Africa are small projects; that is, ones that really don't require very much money. Now, AID knows that as well as everybody else; so does the Bank. The problem is that in order to administer small projects, you need a certain size of staff, and so AID's problem—I mean, I remember, about a year ago, there was discussion at an AID meeting I attended that the regional office in Africa had to deal with some—and I think it was West Africa exclusively—had to deal with, had to monitor, some 600 different projects, very small staff, a handful of people.

That very small staff in fact is an inhibition to developing the kinds of programs that perhaps need to be developed. So it seems to me important to recognize that—I mean, the fact that all of us receive some sort of AID funding, I think, speaks to the fact that it understands the diversity that is needed. But they really frequently don't have the tools with which to carry out their job, and I think that is an important lesson to be learned as well.

Miss **Schneider**. Why can we not utilize some of the non-governmental organizations to do some of that monitoring or training or educating?

Mr. **Meisel**. Well, obviously, they do.

Miss **Schneider**. Can't we do more of it?

Mr. **Meisel**. I mean, the private organizations are responsible for monitoring their own work. On the other hand, if the money comes from AID or the Bank, AID and the Bank and the other agencies have an equal responsibility to make sure that that money is well spent. So it still requires some sort of oversight on the part of the large agencies. And that is a real problem.

I mean, I really want to emphasize again, there is one, or possibly two, nutrition officers in all of Africa; that is, people who are specifically charged with monitoring the nutritional status of the people with whom they work. AID simply does not receive the funds to be able to do that, to do their job properly.

Miss **Schneider**. All right, thank you. Mr. Freeman, do you want to comment?

Mr. **Freeman**. Yes, thank you.

I think I won't call this a mistake but an error of emphasis rather than a mistake. AID has had a lot of chance to learn by mistakes, and I think that on some paper or some evaluation, probably every possible mistake has been recorded that one could make in international development, and AID has taken these into account, as far as I know.

But in the emphasis of food production and agricultural development, I find that there is an excessive amount of emphasis on commodities, improving a specific crop for a specific reason, or growing a specific tree, as opposed to dealing with the totality of a rural development situation.

In particular, the situation of environmental degradation cries out for a more comprehensive approach, and one cannot gain anything by growing more sorghum if soils are degrading or if people are still cutting trees down.

Now, this has been said in various ways already here, but in terms of development assistance, it means a more comprehensive and integrated approach to development assistance in order to make a particular focus viable. The same consideration applies to research as well as to actual field-oriented development.

Miss **Schneider**. I would like to be sensitive to my colleague, who has not had an opportunity to ask a question yet, and perhaps, Dr Aronson, we can come back to your comment later, but I would like to call on my colleague, Congressman Smith.

Mr. **Smith**. Feel free to continue if you wish.

Miss **Schneider**. Well, no, I will pick up later. You take your turn, and I will be back later. Thank you.

Mr. **Smith**. Thank you.

You hear so many of the, I guess you would say horror stories about the starving people in Africa, even though we try to do so much. Could you perhaps specifically give some indications of where—obviously, there must be governmental obstacles, political obstacles if you will, because, at least to my mind, there should really be no reason why people in the world today, given the technology that we have and the capacity to produce food, there really should be no legitimate reason for people to be hungry. Yet obviously they are, in Africa, starving.

What specific—based on what you have done and what you have tried to do in your areas to help, where are these obstacles? Where can we break them down? Obviously, in an area like Ethiopia, we know it is political. But what can we do to get beyond that, to teach people to fish, if you will, to be trite, so that we can get beyond these political obstacles, get beyond these—this is a long question here—but the private versus the governmental—there must be examples of them fumbling over each other and getting in each other's way. I am sure this goes on.

How can we get beyond it? What do we have to do to get beyond this so that we can get the food, not only the food there but, more importantly, to teach people to do what you are trying to teach them to do? What is in your way, specifically?

Mr. MEISEL. I think, if I may, it is a difficult question, obviously, but I think a number of things are in the way, some of which have to do with—only part of which is political. Some of it is systemic; that is, it is built into the way governments work, the way societies work.

The thing that struck me—I started in development, then was away for many years, and then came back to it, and I found that some of the same questions that were being asked 20, 25 years ago are still being asked.

Sometimes I think we expect too much. We think that 99 percent of everything we try has to work. In fact, we are very well off if 20 percent of everything we try works very well.

I think that sometimes, in our concern for efficiency, and in the country's concerns for efficiency, we overlook the fact that in this area, which is the most difficult of all areas—social change, economic change, political change—you have to overlap; that is, it is not an efficient business. We try to allocate our funds as efficiently as we can, but it is not an efficient business. We have to tolerate failure.

The kind of technology that I spoke of this morning—household gardening, family food production, very small-scale kinds of things—I think also gets to the point that you made, which is that since there are inhibitions to getting African countries to raise food prices—everybody knows that African governments should raise food prices because it is the only way that you can get farmers to grow more food.

Fine, except what happens when they do that is that leaders get overthrown. It is a very ticklish question politically because in fact most African governments subsidize food and they subsidize food for the people who live in the cities, because it is the people who live in the cities who create unrest and who overthrow governments.

Witness the Sudan. The Sudanese Government, under pressure from the United States, the multilateral aid agencies, and so on, raised food prices and the leader was overthrown. It is not the only reason, but the middle class started rioting in the streets as soon as prices were increased.

So one approach is to make, perhaps, people more self-sufficient at the local level, and I guess my own feeling about that is that

that can best be done on the microlevel as opposed to the macrolevel. Now, you have to work on all levels, and you have to be prepared for failure.

Now, because foreign aid does not have a constituency in this country, there is a particular drive to make every penny count. Every penny cannot count in this kind of work. You just have to keep trying and hope something works.

Mr. **Freeman**. I would like to add something to——

Mr. **Scheuer**. Let me just react for a moment to what you said. I am not invading your time; this will be on my time.

I think that history proves that you may have gone beyond the bounds that you can prove when you say foreign aid has no constituency in this country. Starting out right after World War II, our country became involved in the Marshall plan. We have been carrying out a foreign aid program ever since to the tune now of well over $300 billion. The most massive, continuous, systematic foreign aid program in the history of human civilization, founded on our Judeo-Christian ethic, on the political and religious beginnings of this country, even in the midst of this awesome budget deficit of $2 trillion that has doubled from $1 trillion only 5 years ago.

It has already doubled, and I certainly don't want to politicize this hearing, but we are in a horrible crunch that has been enormously exacerbated in the last 5 years. We are engaged in absolutely intensive and desperate efforts to get a handle on that deficit. Nobody has suggested cutting out foreign aid.

I think we all ought to take a little pride in what we are doing, and the kinds of things that you were doing. I am very proud to have heard of the things that the three of you, that all of the witnesses have testified to this morning, and I think Americans are proud of what we are doing around the world.

There is not the slightest evidence that we are going to trash the foreign aid program, even though we are in one of the worst economic crunches we have seen in my memory. It is here, it is alive, it is well; we are trying to improve it; we are trying to enhance it; and we are trying to fortify it and give it more resources, give it a little bit of direction. This is the purpose of oversight hearings like this. But take pride in what you are doing and know that the American people support you.

Mr. **Meisel**. Perhaps I engaged in a little bit of hyperbole. I would say—I mean, I think we do have enormous reason to be proud of the efforts that the United States has made since World War II in this area.

But I sometimes think, because the American people are very generous—they are willing to put enormous amounts of money to help starving peoples—you would know better than I the difficulties of justifying a foreign aid program to your constituents. I think that sometimes we carry on an aid program, fortunately, because it is now established over some 40 years that we do that kind of thing.

Sometimes I think it is almost in spite of the fact that, as a people—it is my own judgment—the people of the United States, generous as they are in helping the specific problems, find it difficult to support sustained efforts in an area that is very difficult. We tend to be very solution-oriented, and we get very impatient.

The thing that worries me about aid to Africa is that since these are intractable problems that need multiyear authorizations, not just year by year, but you need to engage in—there is an effort underway at the moment by an organization called Interaction, which is the organization of the private voluntary organizations. They are about to submit to you ladies and gentlemen, and to the Congress as a whole, a program that we have all worked on, a lot of us have worked on, to try to make suggestions for what a 20-year program might look like.

The thing that worries me personally is that because we Americans are spontaneously generous, but we don't have the patience sometimes to engage in working on long-term, intractable problems over a long period of time and to suffer reverses along the way—this is my own opinion——

Mr. SCHEUER. You use a word like "intractable." If we thought they were intractable, we wouldn't be holding hearings today. We don't believe they are intractable.

Mr. MEISEL. By intractable, I don't mean that they don't have solutions, Congressmen. I simply mean that they are very difficult to solve.

Mr. SCHEUER. That is not what the word "intractable" means. It means impossible of solution.

Mr. MEISEL. Yes, I think you are right, actually. Forgive me. I withdraw the word, then.

Mr. SCHEUER. All right.

Mr. MEISEL. They are very difficult problems.

Mr. SCHEUER. Of course, they are difficult. That is why we have the hearing. If they were intractable, we wouldn't have a hearing. Of course, they are difficult, and of course, they need long-term solutions. And what they need more than anything else is the deeper involvement of those countries in these solutions.

Mr. MEISEL. Also.

Mr. SCHEUER. We have not had the kind of cooperation and involvement of African chiefs of states and their ministers that we have had in Asia and Latin America. We have not had the infrastructure. We have not had the support.

I get the very profound feeling, based on all kinds of conversations at the World Bank, that the reason the World Bank is not involved more deeply in family planning programs is not absence of money at the World Bank but absence of applications. There is nothing that Africa needs more than a concerted systematic effort to control its population explosion.

Miss SCHNEIDER. Mr. Chairman.

Mr. SCHEUER. Hold on just a second. But yet, we seem to have difficulty in getting the chiefs of state and their health ministers and their development ministers to prepare applications for funding of family planning programs and other population-sensitive programs like improving the status of women.

Once women get—they say that literacy education is the best contraceptive, and it is essential for women, in order to change their fertility customs, for young couples to change their fertility habits, not only to have the family planning ability, but also for women to accept the fact that there is a different role for her, alternative roles for her, other than consistent, year after year, perennial childbearing.

That means that women must have access to education. They must have access to credit. They must have access to job training. They must have access to employment. The minimum marriage age must be raised—these are population-sensitive programs—along with family planning clinics and so forth.

This whole series of programs, we seem to have difficulty in getting African chiefs of state and their ministers to adapt. There has been far too little progress in improving and enhancing the status and the role of women, and until we do that, all of your garden production programs in the world won't be able to keep up with the 3.5-percent population growth rate or 4-plus percent in Kenya.

So, there are a lot of areas in which improvements have to be made, many of them involving simple decisionmaking in African seats of power. Therein lies much of the problem.

We ought to increase our aid. I would like to see us give 1 percent of GNP to keep up with Sweden and some of the other European groups. But hope springs eternal. We don't believe the problems are intractable. We are going to stick with it, and I know you will, and I now yield the time back to Claudine Schneider, the chairman of this panel.

Miss SCHNEIDER. Thank you.

Just for a clarification for the record, it appears that the AID budget will be $2 billion less than last year, so that is something to take into consideration.

But, Mr. Chairman, I appreciate the opportunity to chair this part of the hearing, and I would very much, under consideration to the minority, like to return this time to my colleague, Mr. Bob Smith, but recognizing that we would like to adjourn at 12, and we also want to make sure, Mr. Chairman, that the Women in Development have their opportunity to present enough of their information.

I know that we have many more questions we would like to ask this panel, but I would like to ask your permission to have the freedom to submit questions in writing to these panelists and to have them provide us with the answers.

Mr. SCHEUER. Are you asking unanimous consent?

Miss SCHNEIDER. Yes; I am asking unanimous consent and your agreement.

Mr. SCHEUER. If there are no objections, it is so ordered.

Miss SCHNEIDER. Are there any objections among my colleagues? [No response.]

Then it is so ordered that we will present additional questions to the three of you and look forward to your answers.

And now I would like to return the time to my colleague, Mr. Smith, who—the real chairman of this committee has assured me—will have his full 5 minutes to ask questions.

But, on behalf of the women who are going to be testifying next, let us be sensitive to the fact that we want to give them their appropriate time, too.

Thank you.

Mr. SMITH. Well, I would be happy to submit my questions in writing, given the comments made by the chairman and the ranking minority member, and I don't want to aggravate the women who are waiting to speak, so I will yield back the balance of my time, Mr. Chairman, so we can move on to the next panel.

Mr. SCHEUER [resuming as Chair]. All right. Congressman Tim Valentine of North Carolina?

Mr. VALENTINE. I don't have any questions, Mr. Chairman.

Mr. SCHEUER. All right. I am just going to ask one very brief question of Albert Meisel. On the bottom of your first page, you say, and quite rightly, "It is equally useful to know what we still don't know." Can you tell us what we still don't know and where you think that kind of research ought to be done?

Mr. MEISEL. Yes; I think I do deal with that in the body of my testimony. But, essentially, it has do with—at least in the particular technology that I was speaking about, family food production—we don't have enough concrete figures about nutritional and nonnutritional economic benefits derived from it. We know it works when we see it work, but we don't have the kind of aggregate figures that will persuade the funders that this is a worthwhile area for pursuit in a greater way than they have pursued it to date. That is essentially what I meant.

Mr. SCHEUER. All right, you did say that.

All right, we thank this panel very much for their marvelously interesting testimony. We will have some further questions in writing for you, and we thank you for your patience and for coming to us.

Mr. MEISEL. Thank you, sir.

Mr. SCHEUER. We will now invite the third group to come to the witness table. This is the panel on Women in Development. We would ask Perdita Huston, author and journalist; Elise Smith, executive director of OEF International, the Overseas Education Fund International, I am informed; and Dr. Christine Obbo, assistant professor of the Department of Anthropology at Wheaton College, would you all come to the witness table, please?

We know Dr. Obbo is here. She will be joining the witness table once she returns to the chamber.

All right, we are delighted to have you both. We didn't mean to upstage you or anticipate any of your remarks by some of the colloquy you have heard here. We are looking forward with keen interest to what you are going to tell us.

First, Perdita Huston, author and journalist, please sum up your testimony and refer to anything you have heard today in 5 or 6 minutes, and then we will have a chance to ask all three of you some questions.

Ms. Huston.

STATEMENT OF PERDITA HUSTON, AUTHOR AND JOURNALIST

Ms. HUSTON. Thank you, Mr. Chairman and members of the committee.

I am perhaps the only nonexpert here today, so I apologize. As a generalist, I hope my comments, my anecdotal comments, will be helpful to what I believe are very important hearings.

I am a journalist and have written several books on women in developing countries but also wore the hat once of Regional Director of the Peace Corps, so that gives me another administrative view of things.

What I would like to do is talk about what women in developing countries, and particularly in Africa in this case, are saying themselves about the predicament they find themselves. How do they describe their burdens, their work, their hopes, their fears for the future, and so on?

I would like to go back just a year or so ago to July 1984 when I was visiting then Upper Volta, which became, 3 days later, Burkina Faso. I spoke with a woman who was in her sixties in a desert-like region in northern Upper Volta. She had been somewhat crippled and could not be in the field at that time of day when all women were in the fields.

We talked for a while, and I asked her what it was like in that region when she was a young girl, and she replied, "Well, I couldn't come to this well. This was a jungle, and there were animals here, wild animals. I was not allowed to come." So, you find in one generation environmental wounds that might just be beyond repair.

A second little anecdote would be that same summer, and that is just 1 year ago, in Tanzania, Togo, and again Burkina Faso. In talking with women at water points—this was a project I was visiting, a film project, looking at water systems and water projects throughout Africa—and again, the comment was heard over and over again from women, "Yes, it is very nice to have water now, to have these wells. But that is not our biggest problem. We always know where to find the water. It may be far away and take a long time to fetch. But that is not our biggest problem. It is the fuel. When we leave in the morning to search for fuel, we never know when we are coming back."

Then the last anecdote, and I am trying to pull three things together here as you will see, I hope, over and over again, in all these countries, you hear the plea for choice in family planning. Quote:

> "You see, we don't have as much land as in my mother's time. There are too many children. The land has been divided up too much. Too many children, and we are poor. I want to have just a few so I can feed them properly and send them to school."

Now, what I am trying to illustrate here by these three anecdotes is that the poor and illiterate women in Africa's villages see the linkage between the crucial population issue, the environment, and sustainable development. They live every day the consequences of those linkages.

But I am afraid, if we get to discussing some of the suggestions, that some of our planners have yet to see those linkages and how important they are to the lives of people in villages.

Dr. Aronson mentioned the three F's of food, fodder, and forests, and certainly that is what women live each day. The women in Africa also speak eloquently about their status and how their very security is dependent, totally dependent, on pleasing the man or men who control their lives, be they father, husband, or brother. Their mobility itself, the ability to come and go as they please, to go to school, to go to training centers, to market, they need permission.

To limit the number of births in a family, the husband must agree. No matter how much a woman may want to plan her family, she may not do so without her husband's permission, and there we have a big attitudinal issue.

Because of the land ownership customs, few women are allowed to own land; thus they are ineligible for credit; thus they do not have access to fertilizer, improved seeds, or appropriate tools; thus they who produce most of the food of Africa are, "left behind like beasts," overworked and vulnerable.

So, I guess what I am asking is, have we lost touch with people? The macroprojects, culturally and inappropriately gender-centered and managed from afar, have produced waste and a great deal of disappointment. My first suggestion, in talking about what can be done—since I think that is probably what you seek from us today—is to train our own development assistance personnel.

It was my experience as a Peace Corps administrator that as I traveled around and spoke with USAID personnel, and so on, the whole concept of Women in Development had not been understood. I will be very bold and say that the Women in Development concept seemed to be perceived by a great many men whom I met in my job as a part of "women's lib." Somehow, Women in Development is perceived as a threat to masculinity rather than commonsense development.

I will tell you an anecdote because I think it is worth taking the time to do so. I will not name the country because you might find out who it was. As the Regional Director of the Peace Corps, I was visiting a country and was asked by the director of Peace Corps in that country to talk with a fellow at the USAID mission who had a multimillion dollar wells project for that country and who had involved the Peace Corps and Peace Corps volunteers in training people to use the wells.

However, it turned out that the wells were not being used. They had been placed "too close to the magic tree" or "too near the ancestors' resting place", and most of the wells were not being used. Women were still going very far away to fetch their water.

So, the Peace Corps director in the country suggested that perhaps it might be appropriate to use women Peace Corps volunteers who spoke the local language to work with women and the engineers to place the wells in the appropriate place. They might be used.

Well, she didn't have the clout to suggest this, or it had not been heard, so the visiting VIP from Washington was ushered into the AID director's office, or the director of this program, really, and he said, "Why have you come?" I started out to explain, but when I mentioned the word "woman" or "women," the gentleman stood up and said, "Oh, you're going to be talking about Women in Development. That doesn't concern me. Talk to my assistant," who happened to be a woman.

Well, I outranked him, so I stood up—and I am tall—and I said, "Sit down," and he did. And, for the next half hour, he had a lesson in commonsense development, who does the work, who should be trained, who should talk to whom, and how to make things happen, at which point he took me out to the car, opened the door, thanked me greatly, and said how much he had learned.

So, my first suggestion is: Train ourselves. We need a new pair of spectacles to look at the world, look at who does the work, look at whose roles are for what, and then plan people-centered development programs.

I am very candid because I don't represent anybody. I think one thing we have done is, we have forgotten women in the development effort, and we have forgotten men in family planning, and I would like to elaborate on that a little bit.

Because it is women who bear the children, one thinks that they are the ones who have to be convinced not to have as many. Believe you me, I have talked with hundreds of women all over the developing world, and they do not need to be convinced. Let us direct our population motivation programs to the husbands, who are the key to women having the choice to plan their families.

With all due respect, Mr. Chairman, this issue of women and literacy, it turns out that yes, that is very true, but if you look at who marries literate women, it is literate men, right?

Mr. SCHEUER. Who marries literate women?

Ms. HUSTON. Yes; I am saying that the women don't have to be literate to be convinced that they want to have fewer children.

Mr. SCHEUER. That is absolutely true.

Ms. HUSTON. All right, so let's not confuse education and common sense.

Mr. SCHEUER. What I meant to say was that when they are literate and they have access to a whole variety of different life roles, they will absolutely insist on curtailing their fertility.

Ms. HUSTON. Yes; but their husbands are also educated and thus permit them to do that, and that is the point I am making. It is that if you enlighten the husbands and things happen in women's lives.

Mr. SCHEUER. I totally agree.

Ms. HUSTON. Thank you.

And as long as we are on that subject, I would also like to express my absolute outrage at some of the population policy issues that are being suggested by the current administration.

I worked as a social worker for many years in very poor villages, and I know that when women have five, six, eight malnourished children, what they do to themselves to avoid another malnourished child. I don't want to be graphic, but if we are, in any way, to deprive people of having contraceptives, then the geranium stem is the local coat hanger, and I find it unconscionable that we, as a people and as a government, would deprive people and create such tragedy in human lives.

Mr. SCHEUER. Are you beginning to——

Ms. HUSTON. Yes; I am beginning to wind down. Let me just say one last—I have two more suggestions, really.

I think it would be time to ask an appropriate agency—whether it is the Women in Development Office at AID or an outside agency, I don't know—to take a look at the programs that have been created in the past 5 or 10 years to provide seed grants to women, training programs to women.

I think we have to prove that this is working and give good examples. The reason we have to prove this is because, just recently, the first international conference following Nairobi was held in Istanbul December 2 and 4. The title of the U.N.-sponsored conference was "The Human Resourse Factor in Development," and there were 67 men and 2 women.

Now, I am making a point here that until we can prove or show and demonstrate with statistics the amazing things that are happening when women have an opportunity to participate, I think we are going to have trouble in convincing those who go to those meetings that the human factor in development does include more than whatever the percentage was.

Last, the support for the private volunteer organizations and a special word for the U.N. Voluntary Fund. The United States contribution to the U.N. Voluntary Fund for Women, which I have seen do tremendously good work in many countries throughout the world, including Africa, I think this group does deserve more support from the United States Government.

Last, one suggestion which came to mind from one of the earlier speakers is learning from people themselves. The Peace Corps has, over the past 25 years, collected a great deal of information on appropriate technology. In other words, they have learned from the people in country, and there is a huge body of knowledge sitting right in Peace Corps, published in manuals, and I would like to point that out, and perhaps a little interagency connection here might be useful in the appropriate technology field.

Thank you kindly.

[The prepared statement of Ms. Huston follows:]

Record Short

Testimony submitted by Perdita C. Huston to the Subcommittee on Natural Resources, Agricultural Research and Environment
October 30, 1985

Hearing Charter: Africa and Hunger, Prospects for Sustainable Development

As a journalist, author and former administrator of development programs, and as a women who has lived for many years in the developing nations, perhaps the most helpful contribution I could make to these important hearings is relating the concerns of the poor, unheard people, -- mostly women -- of those countries. What do they say about the predicament they face? What do African women, as recently as a few months ago, say about their burdens, work and hope/fears for the future?

July 1984, Burkina Passo: Woman at well in desert-like landscape, about 60. What was it like here when you were a child? "I was not allowed to come to this well when I was a little girl; it was a jungle and there were wild animals here."

August 1984, Tanzania, Togo, Burkina Passo: Women at recently installed water points: "Yes, it is nice to have water now.. but that is not our biggest problem. We know where to find water -- it may be far away -- but we know where to go to find it. Our greatest burden is finding fuel. For when we set out to look for firewood, we don't know when we will return. That is our greatest burden and it gets worse all the time."

Or, "You see, we don't have as much land as in my mother's time. There are too many children. The land has been divided too much. Too many children and we are poor. I want to have just a few so I can feed them properly -- and send them to school."

These anecdotes illustrate how well the poor and illiterate women of Africa's villages see the linkages between population, environment and development. They live the consequences of those linkages every day. Alas, planners --- from whatever origin -- are often blind to those connections.

Perhaps they should listen to the "target populations"?

Illiterate, poor and over-worked, yes, but the women of Africa are far from lacking in wisdom or insight. They speak eloquently of how their status -- their very security -- is totally dependent upon pleasinng the man -- father, husband or brother -- who control their lives. To "come and go",-- to scholl, a training center, market -- one needs permission. To limit the number of births, the husband must agree. No matter how much a woman may want to "plan" her family, she may not without the husband's agreement. To do so would be to court disaster.

Because of land ownership customs, few women are allowed to own land -- thus -- they are ineligible for most credit programs --thus -- they do not have access to fertilizer, improved seeds or appropriate tools -- thus -- they who produce most of the food of Africa are "left behind like beasts". Overworked and vulnerable.

The problems of develoment policy? We've lost touch with people. Macro projects -- culturally inappropriate, gender-centered and managed from afar, have produced waste, disappointment and worse.

The families of the developing world/Africa are being torn apart by "progress". And one thing we must learn -- family-centered, people-centered development is the only development that works. Look at the target population, who does what, what roles men and women play in that society and provide the means for them to improve their skills. (Women refugees: dole vs productivity.)

To do this, however, perhaps we should provide skills to our own planners. There are many "beltway bandits" and well-meaning development assistance administrators who would do well to acquire a new pair of spectacles with which to look at the world, the real world. To them, women-in-development holds a connotation of that fearful "women's lib". Somehow "WID" is percieved as threat to masculinity rather than common sense develoment policy. Example/M.E. "My assistant"

So let us train our people first, then perhaps we can do a better job at training others. Train planners to look at the target population, to see the interaction between gender roles, women's status, population, development and environmental wounds... And then design the projects -- the long-term projects, not the quick fixes which look great in reports to the home office. Example-/wells: "Don't have time to train."

Perhaps "taking the time" is the answer. Taking the time to look, listen and think holistically, 20 - 40 years ahead.

In reference to thinking, I would like to conclude by expressing my dismay at the current administration's unconscionable population policy. As I said earlier, the lives and security of poor women are very often dependent upon pleasing their menfolk. Though those women may want to limit the number of children in their families -- as hundreds have told me, personally --(UNFPA) they are not free to do so. It is a male decision. "My husband doesn't understand. He wants more children." or "The village would laugh at him, if I didn't have a child every two years or so". or "I would like to use a method but he would take another wife (or beat me) if I don't bring him children."

Those who suggest rhythm methods or abstinence, in addition to displaying ignorance about the lives and motivation of the people of whom they speak, insult our intelligence and greatly harm the lives of poor women and children. Most women in the developing world do not even get a chance to choose their husband, let alone the time HE chooses to "visit" her. To suggest she can refuse a husband's advances is to display either vast ignorance or total disregard for human dignity. Example: resorting geranium stems' for then the husband will not know. Is that what we want?

Lastly I would like to suggest that an approriate agency undertake a serious study of the women-focused programs that have been initiated in the past 5 - 10 years. The UN Fund for Women, by providing small seed grants to women's projects has been extremely successful in demonstrating the impact small investments can make on the economic and social well-being of communities. Example: Cartagena.

The Overseas Education Fund, the Center for Population and Development Activities, Women's World Banking, and many others have proved that investment in training and providing credit to women has tremendous dividends. It is time planners -- from donor agencies and in national governments -- recognize that fact. If it takes a study to point it out, then let's do the study. Example: 2-4 September Istanbul

People-centered development, particular attention to women's roles and status, coupled with a holistic approach to Africa's need for sound environmental, population and development planning -- from a long-term persective -- is, in the words of women of Africa and other poor regions -- common sense development. Perhaps we -- and the leaders of Africa's nations -- should listen more carefully to those we intend to assist.

Thank you.

Mr. SCHEUER. Thank you very, very much.

Elise Smith, executive director of Overseas Education Fund International.

STATEMENT OF ELISE FIBER-SMITH, EXECUTIVE DIRECTOR, OEF INTERNATIONAL

Ms. SMITH. Thank you, Mr. Chairman.

I am really happy to be here and also at the vision you have of calling forward this subcommittee meeting and having some things we think are important come out for your consideration for the future.

The OEF's name is the Overseas Education Fund of the League of Women Voters. We were founded by the League 47 years ago but have since become an autonomous organization. Long before Women in Development was a phrase anybody talked about, OEF's focus of its programs overseas has been training programs for women.

Our approach to that is, we don't go out with a formula, but we work at the local level with low-income women, listening to their needs and designing the kind of training that will increase their capability of either generating income, increasing food production, and also get the kinds of decisionmaking and planning skills that will help them implement good development programs.

So, we are a real hands-on, long-term development group—not a relief group—that believes that we now have, all of us together, a moment in time to really look at what is happening in Africa and what is happening with women farmers.

I believe very much in action kinds of programs, and OEF has brought here today some recommendations that we think will be useful to you when you look at what can happen to get more resources out to women farmers in Africa who grow so much of the subsistence food.

Everyone on this subcommittee seems very well prepared in terms of understanding the important role of women in agricultural production and all of the roles they play in terms of productivity. When you look at agricultural production and you look at labor and you look at land and you look at technology and you look at where women are in all of that, and you see the great gaps that exist in terms of training that valuable resource, getting that technology to them, and having them have the capacity for ownership of land, which is critical to reaching other resources, then we know that some other things have to happen.

Rather than going more deeply into the issues of land, technology, and labor in terms of where women are, I just want to mention briefly that in the kind of work that we do in the Third World, particularly in Somalia right now, East Africa, and in West Africa, we are working at the local level with national women's organizations.

In one of our programs in West Africa, in Niger, we are working with a group to train trainers, to reach out to local women, to learn new ways to process foods and new ways to conserve food. We find in Somalia that women have the capacity to not just be involved in agroforestry training programs, but they can also learn the management skills, also, that will allow them to help implement and develop and manage agroforestry programs.

So, out of our work in the field and the research and what we know about institutions that are giving lipservice to the fact that yes, women farmers are important, but have not figured out the mechanisms to make it happen, I would like to go over the conclusions just really briefly so you can get a sense about what we think will help make some changes and, in the long run, will give women farmers in Africa the tools they need to do what they want.

At Nairobi, everyone that was there heard African women speak out. I know Congresswoman Schneider was there, as I was there, as many others. And so we believe that by taking those needs, reflecting on the institutions that are trying to get resources out there that we work with, we could come up with some better mechanisms to reach women farmers.

So, if I may, I will go over my list of recommendations briefly, and I would be glad later to take any questions, because it is the action for the future that is where we are all at in this issue. I think there is already agreement on the need.

I think, for one thing, OEF believes that United States policymakers, economic assistance agencies like AID and other international agencies, African governments and regional institutions of learning ought to be very much aware of some of the things that they can do in the areas I am about to recommend attention needs to be given.

First of all, USAID's and USDA's participant training programs. There needs to be a much greater, tougher look at how those are impacting on women, and there need to be some real looks at designing training to fit African women's special needs, and particularly looking at training for women at the lower educational levels, let alone those who come overseas. There are gaps there, and we may even want to target that at least 50 percent of that training ought to be geared to women in Africa.

Second, extension services. From all our experience in the field with women, there just are not adequate extension agent systems out there reaching local women farmers. A lot of complexities are around that, but we believe that we should be able, through our own foreign assistance activities, to support African governments' efforts to strengthen extension services to reach women.

How do we do that? Well, what we hear and what we see out in Africa comes back to say to us that there have to be actively recruited female extension agents. Agents have to get the kind of training so that they can reach effectively those women farmers with appropriate agricultural technology, not home extension type training, which has been often a traditional way of giving some of that extension effort to women.

Agents that work with women in the local level would need to be trained on how to differentiate the sex roles within the farming system and family so that there is a real understanding of how the training has to be shaped. Special materials need to come out of that, and other things, but particularly in extension services, there is more that can be done.

Research institutes. There is a giant gap between what happens at the local level and what reaches women, really, in terms of any of the research going on, let alone that most of the research in the agricultural institutions is not necessarily focused on the subsistence farming crops that women primarily are responsible. There has to be more attention to that if you are really going to give women some of the new kinds of research technologies that will help them and expand their ability to increase their production in that level.

I have a list of very specific things under the research institutions. I think those institutions have got to find a way to connect to local organizations that reach the village level. There is a big gap between those groups that provide the research at one level reaching down to the local village level, and I think part of that is because they do not connect to the nongovernmental groups that are there or other indigenous groups that have an infrastructure to reach out to the villages. There is a whole gap in this communication of even what is already part of the new research that supposedly is to get out to the village level.

I think, in the area of appropriate technology, that the OEF believes that the United States and other organizations, working with appropriate technology, need to give more focus on the ways to lighten women's workloads, because all the data show that, for their domestic responsibilities, their production responsibilities in the field, their efforts to get fuel and water, we need newer and better technologies to help with water, fuel, weeding, and food processing.

I think there are also efforts that have to be made for the establishment of small women's rural enterprises which will help women get more income at the local level, and it is possible.

Now, I am going to more briefly mention four other very specific suggestions. But before I do, I do want to say one thing about the area of legal rights for women and ownership of land.

At Nairobi, the OEF sponsored a 4-day Forum on Women, Law and Development. We brought women from Africa and other continents together. The big issue under the land and rights of ownership was a major item on their agenda. Why? Because when ownership of land is given to women or they have more access to that, it opens up, as Perdita mentioned, other opportunities for them—the opportunity to have credit, the opportunity to have technical training that is denied them because they are not perceived of as landowners. So, I think that is another key area.

~~Now, in the~~ four special comments that I want to make, I think that one way to galvanize some things on the part of our own foreign assistance agency, USAID, and others that care about what is happening with women but have not quite figured out quite where to go with it, is that we need to encourage AID to take a leadership role along with African governments and appropriate NGO's to plan a series of regional conferences to systematically review the strategies that have proved successful in increasing the agricultural productivity of African women farmers.

We have never, through our own resources going to Africa, systematically looked at what works and what hasn't worked in terms of getting resources out to African women. I serve on a small task force inside AID, which is a PVO–AID Africa task force, and I have made some other recommendations to them that I will mention later if you are interested.

A second thing that we think is critical is that USAID must be directed to strengthen the currently diminishing capacity of the Women in Development Office, and strengthen the role of the Women in Development officers in all African missions to ensure that women are completely involved from the bottom up in the planning and implementation of program work.

Third, I would say that, finally, I think AID needs to be directed to increase its support for long-term PVO development, as PVO's are effective agents that can reach low-income women farmers. I think that experience has shown that they have a greater capability to do more. The American public has been giving them greater resources, but so should U.S. foreign assistance look at that.

I will stop there, but I think that if anybody wants to ask me more specific questions. I think we have a real moment, a real opportunity. I mean, suddenly, it is like the world has awakened to the fact that we have got to do something with women farmers. We have got to reach women in the rural areas. But nobody is setting out the strategies and the mechanisms to do it.

What I hope is helpful in terms of the list I have given today is that those are some things that can help move along that agenda.

Thank you very much.

[The prepared statement of Ms. Fiber-Smith follows:]

TESTIMONY OF ELISE FIBER-SMITH

Executive Director of OEF International

Before the House Subcommittee on
Natural Resources, Agriculture Research & Environment

Committee on Science and Technology

October 30, 1985

INTRODUCTION

Mr. Chairman and members of the subcommittee, on behalf of my organization, I congratulate you for the vision you have shown in holding this important series of hearings. We appreciate your invitation to present testimony, and take this opportunity to focus on the need for increased attention to training, technology transfer, and farming systems that take into account the role of women in African agricultural development.

I am Elise Fiber-Smith, Executive Director of OEF International (formerly the Overseas Education Fund). OEF was founded by the League of Women Voters in 1947, though we are now independent of League affiliation. OEF is a nonprofit development assistance organization or "PVO" dedicated to enabling women--particularly low-income women--to improve the quality of life for themselves, their families, and their communities. For over 38 years, OEF International has been involved in women in development programs. During this period, the organization has sought to improve the socioeconomic status of women through their integration into the development processes of their countries.

OEF has a West Africa Regional office in Senegal, where we are involved in the transfer of technology in agriculture, food preservation, and nutrition. In addition, in Senegal, Niger, and the Gambia, OEF is engaged in strengthening national women's organizations in order for them to work more effectively with village women in food-related activities. In East Africa, OEF is collaborating with the National Range Agency and an indigenous women's organization in Somalia to assist 3700 refugee women and their families in reforestation and horticulture.

The testimony I am delivering today is based on our own experience, as well as pertinent research findings, and leads to various clear conclusions and recommendations.

To effectively address the issues raised by this hearing, I would now like to speak to the three major factors upon which agriculture is dependent: labor, land, and technology, as they relate to women.

LABOR

For any development program to succeed, the crucial roles that women play, not only in agriculture but also in rural life in general, need to be taken into account. In addition, long-term goals can only be attained when women have access to and control over resources and benefits from their labor.

Several underlying factors must be kept in mind regarding women in Africa:

+ Foremost is the fact that women play a vital but often invisible role in the production of subsistence and cash crops as well as livestock.

+ Second, women have second-class status when it comes to agricultural education, extension, and credit services.

+ Third, women lack access to inputs or resources (e.g., land, capital, technology), preventing their full participation in the development process.

+ Fourth, women's agricultural and domestic workload increases when men and children take up off-farm work.

Given the drought and concomitant socioeconomic crisis, in sub-Saharan Africa the plight of women is particularly difficult. A typical day in a rural area begins before dawn and ends late at night--frequently 16 hours long. Women carry out as much as 80% of the farm activities, provide up to 90% of the rural food supply, and are responsible for the well-being of the family.

Let me give you a clearer picture of what women do:

+ They work in all aspects of cultivation (planting, thinning, weeding, applying fertilizer, and harvesting).

+ They handle vegetable gardening unless there is a cash market.

+ They do virtually all of the tasks associated with food processing and domestic food storage.

+ Small animal production for family or market is also usually women's work. In many countries, they are also responsible for cattle (milking cows and calves).

+ Some tasks which are considered men's work, e.g., clearing and preparing land, may also have high participation rates by women.

+ They not only provide labor, but also participate in resource allocation and farm management decisions.

The division of labor by gender has changed in many places because of need. Where such change occurs, women tend to take on what was traditionally men's work, but not vice versa. The number of female-headed households is increasing. Where mechanization and cash cropping are introduced, men have tended to take over. As a result, men's workload is lightened (e.g., by tractors for plowing) while women's workload increases.

It is obvious that the most critical input into subsistence agriculture--women's labor--is highly constrained by numerous and equally pressing demands. Their health is compromised by their "double day," chronic undernutrition, and childrearing. Women have been found hungry with millet in their granaries but they were too exhausted to work three hours more preparing food to eat. (For example, maize preparation is estimated to take 13 hours to pound for a family every 4-5 days.) Grinding, husking, pounding, let alone cooking, getting water, and gathering fuelwood are all women's work. And, of course, there are always childcare and domestic chores. No wonder women have switched to other crops that need less processing, or sometimes to imported rice and wheat. This can have serious consequences for nutrition and self-sufficiency in basic foods.

And, after all is done, women often do not have control over the fruits of their labor. Where there are incentives and women do control their income, they have been found to earn twice as much as men who had their wives working as free family labor.

Women not only contribute their labor, they must also make decisions about household and farm resources. Nevertheless, for various reasons, women are usually excluded from community decision-making at all levels. They either do not have the time to participate, do not know how, are illiterate, or are culturally prohibited from participating. However, it is clear that women's participation strengthens any development program, anywhere. Congress recognized this over 10 years ago with the adoption of the Women in Development to the Foreign Assistance Act.

The development of women as critical human resources is one of OEF's greatest strengths. Our projects worldwide are people-centered. Our training methodology is participatory--learning-by-doing. Concepts like planning, evaluation, feasibility, credit, marketing, etc., are demystified by starting from what people already know from experience. The result is increased confidence in individual and group ability to control participants' lives.

For example, OEF provided training for Moroccan and Panamanian women to develop self-confidence, to consider profitable areas of work not typically open to women, and to learn needed technical skills. In Morocco, the women subsequently established cooperatives involving them in beekeeping and marketing honey. In Panama, they started their own businesses in nontraditional work such as horticulture and upholstery. In Honduras, we are in the pig business. Poor women are now able to raise pigs and get credit to improve their businesses. In El Salvador, OEF helped 29 loosely organized housewives to establish a tomato processing cooperative that today consists of 200 members. They have learned to cultivate, process, can and market tomatoes, and have secured loans from international banks for a new processing plant.

OEF's program in West Africa has proven that our participatory methodology for human resource development is equally effective there. Senegalese women belonging to a local PVO are being trained in the core human resource course using our training modules, as well as in horticulture, soapmaking, nutrition, and literacy.

At another level, OEF focuses on strengthening indigenous organizations to be effective intermediaries for servicing women's needs and increasing women's impact on decisionmakers and planners. OEF's work in Senegal, Niger, and the Gambia also involves institution building. With a Regional Advisory Committee composed of two women leaders from each of the three countries, our staff has provided training and technical assistance to four national women's organizations. Training interventions in West Africa have included such areas as needs assessment, workshop planning, and training of trainers on conservation and processing of manioc/cassava. The potential is great for local organizations like these to be dynamic managers of rural development.

LAND

Another vital factor in subsistence agriculture is land. Africa is characterized by infertile old soil that is increasingly subject to erosion, and by large unirrigated areas. The following practices further complicate the picture:

+ The burning of crop residues and other organic matter is a common way to clear the fields which further damages the soil. At the same time, fertilizer is usually expensive or unavailable.

+ Fallow periods are either a nonaffordable luxury or are getting shorter with increasing demands for land to produce.

+ Partly because of population increase, more and more acreage is being put into production, at the expense of forests, bottomlands, and watersheds.

With increased land use and decreased soil fertility, women are the first to suffer. They need to work harder to get the same harvest. They have to walk long distances as fuelwood becomes more scarce around settlements. Wild plants gathered by women, which are important sources of fuel, fiber, fodder, and medicine, are fast disappearing. Less desirable land and steep hillsides are being cultivated. Yields are falling--the cycle of soil degradation has begun.

Issues of land use and land tenure are very relevant for women. In most African countries, increased demand for land has meant women's loss of their rights as property owners. Poor land management such as overgrazing, and reluctance to install permanent improvements on the land (e.g., trees, windbreaks, terraces, ditches) may result from the lack of a feeling of ownership of the land. Often women are responsible for the initial establishment and tending of the wood stock around the village. However, lack of decisionmaking power over cropping patterns and lack of control over the potential tree harvest can make women reluctant to implement agroforestry techniques.

Land is also key to other development inputs, such as credit, agricultural training and extension, irrigation, chemicals, and membership in cooperatives. In Africa where the trend is to remove women's rights to land, these necessary inputs become increasingly inaccessible to female farmers. Innovative credit programs are also essential to bring women into the economic mainstream. Through one such creative program that utilizes training and a guarantee loan fund, OEF is successfully impacting peasant women's groups and the banking establishment in Central America.

TECHNOLOGY

Appropriate technology needs to address all aspects of labor productivity. Large equipment, such as tractors, is often uneconomical and sometimes has had negative results overall. Projects have floundered for lack of a single foreign nut or bolt or something as simple as plastic bags for seedlings. This was the case in Somalia where OEF staff had to go to great pains to ensure the availability of locally-produced seedling bags for use in a reforestation project, thus guaranteeing project continuity and eliminating dependence on imported resources.

Agricultural research in Africa is young, and according to the World Bank, proven technologies will probably not be generally available until the 1990s. A logical first step is to extend already available cash-crop technology to women, where appropriate. An example of promising research is cassava that is high-yielding but requires no extra inputs. This is being developed by International Institute of Tropical Agriculture in Nigeria. For the short term, however, production technology should include a broad range of subsistence crops, agroforestry, and related simple ways of increasing soil fertility.

The introduction of a seemingly simple technology usually creates other needs. For example, under traditional farming systems, weeding creates bottlenecks in labor availability. When improved seed is introduced, fertilizer and increased weeding may be required. Minimum tillage techniques without herbicides would also imply more weeding. When technology such as composting or biointensive gardening is introduced, implements such as shovels, forks, and carts, are required.

Often, we forget that African farmers already have a rich store of indigenous knowledge which has enabled them to survive over the centuries. Technology transfer should be based on that knowledge. At times, it may be preferable to teach fuel-saving techniques for cooking with a three-stone fireplace rather than introducing new, improved stoves. Or, it may be appropriate to simply advise farmers not to walk in fields immediately after the rain, or to avoid smoking tobacco to prevent the spread of plant disease. In short, the technology must fit the need, and the beneficiaries must be prepared to accept it.

All too often, new technologies are introduced to men, demoting women from independent producers to laborers with no rights to a share in the profits of the enterprise. By incorrectly assuming that heads of households are always men and also that innovations "trickle down" to other family members, many projects and extension efforts have failed to reach women farmers, sometimes with disastrous results, as in the use of chemical inputs.

In many places, women extension agents are the only channel through which to contact village women. However, they are few and often poorly trained. Emphasis has been on home economics which is irrelevant to women farmers. Moreover, training facilities for women farmers are inadequate.

However, where women have received agricultural extension services, production has increased significantly.

And lastly, women's critical role in food conservation and storage must be taken into account. Imagine, if you will, attempting to fill a badly leaking bucket by pouring more water in and not plugging the leak. This is what happens when programs focus only on increased production. Sustainable agriculture implies a two-pronged approach: increasing production and conservation. The true productivity of any food system must be measured by the amount of food available for people to eat. Food losses, often up to one-third of harvested yield, represent a waste of: much needed food, good arable land on which that food was grown, the nutrients which the crop has taken out of the soil, and the human energy and other inputs expended in cultivation and harvesting.

In sum, managers of rural development in Africa need to carefully design agriculture programs, taking into account the woman farmer. Failure to do so may represent a serious oversight in sub-Saharan agriculture. Issues of land and technology need consideration at least insofar as they reduce the labor constraint to food production.

CONCLUSIONS AND RECOMMENDATIONS

The foregoing discussion of the importance of taking women into consideration in training, technology transfer, and farming systems, compels us to make the following conclusions about special needs in sub-Saharan agriculture. These conclusions are directed towards the major actors, such as US policymakers, economic assistance agencies like USAID, other international agencies, African governments, and regional institutions of learning. OEF believes there is a need to:

1. Review USAID's and USDA's participant training program to ensure that women are actively recruited to training institutions in the US as well as in developing countries. Redesign training to fit African women's special needs, such as training for women at lower educational levels.

2. Support African governments' efforts to strengthen extension service capability to reach African women farmers:

2.1 Actively recruit female extension agents.

2.2 Conduct routine in-house staff development for continued upgrading of agents' skills so they can more effectively reach women farmers with appropriate agricultural technology.
Train agents in effective participatory, nonformal methods of extension and training;
Conduct practica on vegetable production, afforestation, and small livestock husbandry;
Train agents in data collection to obtain sex-disaggregated data on activities and cultural and legal constraints relevant to all production activities of women and men.

2.3 Develop specific training materials for women which consider their special needs in terms of literacy, knowledge, and skills.

2.4 Establish training facilities which are appropriate for women with young children.

2.5 Assess the value of using more paraprofessionals in the field to expand the number of agents delivering services to women.

2.6 Last, but perhaps most radical and encompassing, examine ways of making the whole extension institution answerable to its beneficiaries, making incentives dependent on agent' responsiveness to villagers, especially women.

3. Provide resources and technical assistance to groups that are enabling women to be involved in decisionmaking and planning that affect their lives.

3.1 Encourage projects that actively involve women in training to participate in village council meetings.

3.2 Assist in the development of effective women's voluntary organizations to act as intermediaries in development.

4. Strengthen the capabilities of regional and national research institutions to be responsive to research needs of women farmers:

4.1 Support research on a wide range of subsistence food-related activities.

4.2 Support research on new varieties of staple crops that increase productivity and output with little or no increase in purchased inputs (such as IITA's work on cassava).

4.3 Record, disseminate, and incorporate into research, germ plasm, and extension programs, women's knowledge of indigenous plants that are fast disappearing.

4.4 In farming systems research, include social scientists as regular team members, and actively seek the cooperation of women for on-farm trials.

4.5 Expand participatory research where appropriate on minimum tillage practices, biointensive gardening, composting, mulching, cover crops, etc., with necessary inputs (including credit) and labor-saving devices.

4.6 Study the acceptability of methods to increase soil fertility and erosion control that have been successfully developed and used in other developing countries.

4.7 Work with women, where relevant, to develop livestock systems, including fodder production, animal health and nutrition, that minimize environmental damage.

5. Support US and other organizations working with appropriate technology:

   5.1 Develop ways to lighten women's workload, especially with regards to water, fuel, weeding, food processing.

   5.2 Assist the development of small industries that are supportive of rural life and agriculture.

6. Encourage the establishment of small rural enterprises that not only build up agriculture but provide rural employment as well.

   6.1 Produce traditional and improved agricultural implements (weeders, carts, grinders, etc.).

   6.2 Process foods primarily for local consumption (grain mills, food drying, local weaning foods, tomato processing, oil extraction, etc.).

FINAL COMMENTS

The 1985 Nairobi conference marked the end of the UN Decade for Women. Now, at the conclusion of this decade, despite overwhelming evidence of the vital role that Third World women must play in the development of their countries, we are concerned about certain policy trends that may negatively affect Women in Development (WID) projects. Because of staff cutbacks due to a shrinking budget and the growing administrative burden, the ability of AID missions to capture programmatic opportunities in a timely manner is greatly diminished. The resultant emphasis on fewer yet larger programs reverses the progress made through smaller model projects aimed at economic development and self-help efforts, as mandated by Congress over ten years ago. AID's response to this dilemma has varied from Mission to Mission. However, the total effect, and, in particular, its impact on women is not known at this time.

While we realize that the following recomendations may not fall strictly within the purview of this Subcommittee, the implications for training, technology transfer and farming systems as they relate to women in African agricultural development are such that we feel that it is appropriate to bring them to your attention. We take this opportunity to recommend that Congress:

1. Direct USAID to strengthen the currently diminishing capacity of the WID office and strengthen the role of WID officers in African Missions to ensure that women participate in all phases of program planning and implementation, and that they participate fully in the total development effort.

2. Encourage USAID to take a leadership role, along with African governments and appropriate non-governmental organizations, in planning a series of regional conferences to systematically review the strategies that have proved successful in increasing the agricultural productivity of African women farmers. Topics should include training, technology transfer, and farming systems.

3. Direct AID to increase support for long-term PVO programs as effective vehicles for reaching low-resource women farmers at the village level. Experience during the recent crisis has shown that PVOs have the on-the-ground expertise necessary to efficiently provide needed technical assistance.

4. **Encourage the US State Department, USAID and the UN High Commissioner for Refugees to direct more of their resources to the recovery and long-term development needs of African women refugees.**

Mr. Scheuer. Thank you very much, Ms. Smith.

Now we will hear from Dr. Christine Obbo, assistant professor in the Department of Anthropology at Wheaton College.

Dr. Obbo.

STATEMENT OF DR. CHRISTINE OBBO, ASSISTANT PROFESSOR, ANTHROPOLOGY DEPARTMENT, WHEATON COLLEGE

Dr. Obbo. Thank you very much, Mr. Chairman and distinguished members of the committee.

I feel very privileged to be addressing this committee. I do appreciate the opportunity for being here, and I do appreciate very much the work the committee is doing.

Before I go on with my topic, I just want to put a footnote on my amusement at some of the testimony this morning, because it really reveals what is at the base of development and why a lot of Africans have not been reached.

When people talk about we need to have more world forests, world trees used, Africans have always used trees as food. If you look at the Sahel, the Dagon of Mali have always had a tradition of planting trees. So at what point did the people lose that art of planting trees? It is not a new thing.

If you talk of kitchen gardens, when I was growing up, you could tell which homes had no women in them because they did not have a kitchen garden with the fruits and vegetables and things. So I think we really need to think about this very carefully.

I also want to talk about family planning, but at what point did women lose the pressure they used to have on men not to force them to have more children than they needed, because every African country, every African society, had sanctions for people who wanted to have too many children, that in fact you could get into trouble for violating a woman's body. So I really think these need to be thought out when we are planning development projects.

The urgency of the food crisis in Africa is obvious to everyone, so we don't need to repeat it. What needs to be really talked about is the issue of food security, and this needs to be done very quickly, because the longer we wait, the more expensive it gets.

We are going to need policies and programs that are going to consider African women as the traditional producers and purchasers of food. I think at some point people are not really sure whether African women are the producers or processors of food, and I think we really need to reinforce this in people's minds.

The whole issue of agronomists not wanting to talk about Women in Development is a key issue in this. An agronomist has more information than an anthropologist who is talking about women. So you say, "this is a women's issue." One of the issues is in fact improving production of food. I think we need to integrate those areas.

The other issue that is becoming critical in Africa is this business of the shortage of labor for small farmers. People have ready solutions. They say, "oh, well, men are migrating to the cities." Now, as far as I am concerned, that is not true. The shortage of labor on the farms has something to do with women, that women are in fact overworked.

So if you are planning development projects, you don't ask women who are already contributing 90 percent of the labor force to work a little more to improve development in these countries. Women are already the backbone, and we don't want to break the backbone, and we want it to survive.

I have reached certain conclusions since this summer, when I was a member of the Non-Government Conference in Nairobi, and also based on my research in the last few years in Africa. In fact, the issue is not producing more food per acre; the issue is increasing food production per person.

If you start thinking about the issues of food quality, then you are going to shift the argument. The argument is not growing more food—you should grow more food—but the argument is having food security through good methods of processing food.

Processing food takes different dimensions. It involves about four things. It involves processing food, storage, transportation, and marketing, and I am going to outline briefly what I mean by all of these things.

First of all, we need knowledge. I suppose you can call knowledge a kind of technology. So we need knowledge and technology to deal with these issues.

In the research I was involved in in Western Kenya, half the grain was wasted on mildew, rodents, and insects. That is a lot of grain. So the farmers, working with the Manhattan Associates, who are based at the university, decided they were going to help women build better storage containers.

Also—they were men agronomists—they decided that you can persuade women to harvest grain a week earlier or a week later, that it makes a critical difference in this. So this is going on.

So there is lot of wastage of food that has been harvested, and we need to concentrate on looking at that. I can pick a few grains at random. The reason maize has become a popular crop in Africa is because it takes a short time to prepare, but it has less value than millet or sorghum. Millet and sorghum take too long to prepare, so people don't want to deal with it.

In areas where you have grain mills, people have maintained this as a traditional kind of food. Millet has 60 percent protein in it, so we should promote this for Africa. The reason millet is sometimes rejected is sometimes the new hybrids have long stalks, and the women don't want to deal with them, or sometimes they cannot be harvested with the traditional knife. So I think, if you are talking about appropriate technology, these are the issues, so that people can have nutritious food.

The other crop which has caught on in Africa is cassava, which is now widely eaten. But the problem with cassava is that you either have to eat it right away or you have to dry it quickly, and there is no technology at present to do that. A lot of cassava does rot.

A lot of cassava in most of the tropics cannot dry because it is always raining, so you need a system of drying it. Someone has tried solar driers and they seem to be very effective, at least in some parts of Uganda.

If you look at fish, fish again is a very perishable thing, and the United Nations Fund for Women has actually studied some stoves in Ghana and the neighboring countries that have really made a big difference, both in the food quality and also in women's income-earning capacities.

On the issue of storage, again, as I said, the storage is badly built because people are in a hurry, people are producing more food, building inferior granaries, and the rats are getting in and insects are getting in. So we need to convince people to build better storage.

The reason why you need better storage is because, in most villages, people do sell off food as soon as they harvest it. You sell it off while it is good so that you are not stuck with rotting food. And then some people are buying food at a more expensive price later on in the season.

So, really, the reason for improving food storage is making people secure all year to have food with them. Also, people could sell food when they feel like selling it instead of being forced to sell it because it is the harvest season.

Storage also could facilitate the urban populations to eat better food. I think, in the whole discussion, people always forget that the rural women still feed the urban population, that every weekend you have these buses that leave the countryside with food to feed the urban population. If you improve food storage, there will be better food going to the cities.

The issue of transportation again is very important if you are talking about women improving production or transportation in the rural areas. In some areas in which I have worked, women who become very successful farmers or very successful politicians, who gain local clout, have invested some money in cattle and a wheel, so they cart around the grain and food. It really makes a big difference, just one wheel on a cow. It is a small investment but it makes a difference in women's lives.

I also feel that marketing facilities should be part of every rural development project, because you can help people store food—I mean, every African farmer woman is not going to have a good storage bin, so it is good to have these centers where you can store food.

Rural markets also do help people recycle food. I mean, what we know historically about Africa is that different regions did produce different foods, and if you did not have honey, you got it from another group. If you did not have music, you got it from another group. People exchanged resources, and I think development projects need to encourage this and get away from, Ah, this is the colonial boundary of the country of Uganda, and you are in your country and you have your passports, and deal with this, but we need to encourage this informal flow of information and ideas and trade.

Basically, what I am saying is that we need to increase the food security for Africa by really concentrating on what women want, and I think these are things women want. Women need improved technology on how to store food, how to process food, how to transport it, and how to market it. I think it would be a great opportunity for development agencies to do this.

For development to be self-sustaining, we need to give women skills to carry out these things later after the developers have left.

There are two examples from Africa which I am sure you know, but I want to share them with you all the same.

The first one was the grain mill in Tanzania. That was started by a group of women, a women's cooperative. The only problem was that these women were illiterate and they didn't have the necessary skills to run a grainmill, like you must have bookkeeping and you need the technical skills to run the mill; you need the managerial skills.

So they had to hire a man to do it, and the long and short of it is that the cooperative collapsed because the man was cheating them. Actually, I had a letter this week that they are back in business. They have had to train themselves in how to do these things, so that is a good story.

The other story comes from Egypt. It is the village of Basseisa, which is 100 kilometers north of Cairo. The last speaker talked about encouraging women who work in AID to be effective, and this has something to do with that. But it takes a long time to convince people that this is a good idea.

In this village of Basseisa, a woman came back from Cornell with a Ph.D. in Agronomy. She had lived in Cairo all her life. But she went to this village and said, "Look, I was born here and I lived here for 2 weeks of my life; I am part of this village." People are very, very suspicious, but it took her 3 years to convince them that she really had their interests at heart.

The long and short of it was that she convinced them that they should have a solar oven. Now, this sounds very simple, a solar thing built on cow dung and all of that. But it did change people's lives. People are spending less energy on doing unnecessary things.

A change in the social system—you know, people go there and think we are going to change veiling women and we are going to change this. You change it by doing something like this. You have a solar oven which brings men and women together, and people soon forget that they are supposed to have these separations between the sexes.

So I think I will stop there and entertain any questions.

[The prepared statement of Dr. Obbo follows:]

Testimony of Christine Obbo

Ugandan Anthropologist

Before the House Subcommittee on Natural Resources, Agricultural Research and Environment Committee on Science and Technology.

Mr. Chairman and Distinguished Members of the House of Representatives,

It is a great honor for one to address this distinguished committee on Science and Technology of the U.S. Congress.

I do appreciate the committee's interest in the issues that have been raised today. Population, appropriate technology, environment integration of women in development and traditional practices are relevant areas that attention should be focused on.

However, I want to shift the focus a little to the food crisis which is obvious to everyone. This demands an urgent goal that focuses not only on food production but upon speeding up food security in the most sustainable way possible. In other words, increased food production has to be matched by improved methods of food preservation.

Rural women, working on small scale farms produce 90% of the food consumed locally. Therefore women as the backbones of the African food system (ie. its production, processing and marketing) need to be given special attention when planning and implementing any policies connected with feeding Africa and ensuring that food shortages and other avoidable food crises are eradicated. Most of the food consumed in Africa is produced on small farms that are heavily dependent on female labor. Conservatively the Food and Agricultural Organization estimates that women constitute 47% of the agricultural labor force thus contributing two thirds of the labor hours. Perhaps the contributions of women in total labor hours can be best appreciated if we look at the division of labor by sex in Africa shown by the table below.

	Women	Men
1) Hoeing	70%	30%
2) Transporting crops from the fields	80%	20%
3) Storing crops	90%	10%
4) Collecting and carrying water and fuel	90%	10%
5) Processing food crops	90%	10%
6) Marketing surplus food	60%	40%
7) Harvesting	60%	40%
8) Weeding	70%	30%

The table suggests four interrelated areas for which appropriate knowledge, technology and funding need to be focused to eradicate food shortages. The long time objective of realizing food security in Africa will require improvements in the processing, storage, trasnportation and marketing of food. I will illustrate the four points with examples to indicate why they are important.

Food Processing and Appropriate Technology

This would save time and free women to improve their literacy skills. At present processing food takes too long and even with the best will, women are too tired at the end of it to do anything else. Women who can read will not only follow instructions on nutrition, fertilizing the fields and animal husbandry, they will be able to operate simple technologies. Women are already willing to save (grinding) muscle power but instead walk up to three miles or more in search of a grinding mill for their corn and millet. Evidence suggests that in formerly millet consuming areas, the women have eagerly adopted cassava and maize because they can be eaten green thus saving processing time. Agronomists and planners need to pay more attention to what women define as their needs and solutions to the problems of food processing. Women do welcome appropriate technologies that save time. In the Tanzania region of Arusha a group of women formed a co-operative and bought a mill. However, having no managerial, technical or business skills, they hired a man to run it. He proceeded to cheat them, the co-operative was almost bankrupt. The man operates the machines but the bookkeeping has been taken over by a more skilled and wise membership. These women were faced with the classical development dilemma: creating jobs for men because women lack the skills. Another example of a successful adoption of appropriate technology is a Busaisa village in Egypt. It took three years for a Cornell graduate to convince the villagers to accept a communal solar oven. It is going to result in many social changes. Lastly, the most dramatic example of successful appropriate technology is the United Nations Voluntary Fund for Women Project with Fish Smoking Stoves in Ghana which many West African women are quickly importing and adopting.

In summary, appropriate technology would not only be time saving, it will improve the nutritional value of the diet. The latter is threatened by for example, soaking cassava and maize to make the processing, ie. pounding, easy but in the process vitamin A and D are destroyed. It is not enough to improve per acre production if food is going to be wasted.

Food Storage

According to FAO estimates 20% of the grain produced in Africa is wasted. The Manhattan Associates Project researchers in Western Kenya has found half the grain is lost due to mildew, rodents and insects. Accordingly they are helping the farmers improve their grain stores, to harvest when the grain is completely dry, etc. Farmers will be offered credit and actively trained. This will mean food will be available on an all year round basis. It will mean that families will not be selling off food cheaply to save it from rotting, and then later buying it back at higher prices from unscruplous merchants. Also some stored food can be sold to the highest bidder when the families need an income.

Transportation

Improved roads and transportation services could ensure that the urban populations are fed on a regular basis, and that families can easily sell their food produce when they need money.

Marketing

Already food circulates in the rural areas through markets. However, storage facilities at marketplaces would greatly improve the variety of food available. In other words, food storage facilities need to be incorporated in all food system plans.

Conclusion

I want to say that development programs have rightly paid attention to improving land productivity, but the issue of food stability has not received the attention it deserves. The main thrust of my testimony today has been to call attention to the importance of enabling women (through the four areas discussed above) to effectively cope with the post harvest period of food production. The stability and efficiency of food systems should not be neglected through an over-emphasis on production.

Thank you very much Mr. Chairman. I will be delighted to answer any questions.

Mr. **Scheuer**. Thank you very, very much, Dr. Obbo. We benefited greatly by your testimony.

Congresswoman Schneider, my distinguished colleague from Rhode Island.

Miss **Schneider**. I would just like to pick up on the solar oven. I have heard tell of some instances where solar ovens have been introduced into developing nations as a failure in that most of the cooking and activity was taking place after the sun had already set. So we need to be careful about how we promote that. If we were going to be using solar ovens for processing or for drying of foods to better suit them for storage, I think that is certainly an appropriate approach.

The testimony of all three of you I found very exciting and just right to the point, and a number of terrific recommendations that we will be picking up on.

I am delighted, Dr. Obbo, that you had focused on storage technology, because that is something that has not come to the forefront in our hearings so far, and it has been brought to my attention that somewhere around 30 percent of all the food that is produced is lost in the storage process, and it is tragic to recognize that there are so many hungry people, and yet food is being lost or wasted.

And so we need to find the technological answers to the storage and processing, and I am hopeful that some experts will come our way so that we can have some tangible solutions. So if any of you are familiar with folk who are well trained in that area, it would be terrific, because we would look toward promoting such an effort.

The only other thing that I might add is that—I will throw this question open to the three of you—do you think that it is appropriate for us to earmark numbers or make requirements such as that 50 percent of the participants in the extension service programs must be women? Do you think that it is appropriate to establish that kind of sort of quota? I hate to use that word. It has become a dirty word any more, but to earmark training funds. Do you think it is a good idea?

Ms. SMITH. Well, I will take a stab at the answer to that. As you know, I do care about that issue.

I think, for one thing, if one looked at a quota in order to try to stimulate more participation of women, you have to also go back and look at the way the training programs are designed. If the criteria are such that it makes it difficult for women to participate, then the criteria for who and where that training takes place and who participates need to be redesigned. That is the way you are going to expand the base of people being able to take advantage of that, particularly women.

So I don't think it is impossible to set a quota to be an encouraging and motivating factor, but I think you have to also go back and look at the criteria.

Miss SCHNEIDER. All right. Yes, Ms. Huston?

Mr. SCHEUER. Can I follow up that question, in my time and not in your time?

Miss SCHNEIDER. Sure thing.

Mr. SCHEUER. I would like to address this to Dr. Obbo. Dr. Obbo, the United States is frequently accused of imposing its culture norms on other countries, and this is frequently called cultural imperialism.

If we earmark these funds so as to require that 50 percent of agricultural extension worker training slots be filled by women—in effect, imposing our standards that women should be equal participants with men in these training programs—would we be accused of cultural imperialism?

Dr. OBBO. I haven't heard that argument lately. [Laughter.]

But I don't think so. You know, if you want to get aid, I suppose you have to follow certain things. I think most countries realize that.

I don't think it would work, for a different reason, because different countries of Africa have different ways of—in some of Africa, a woman is a better person to listen because she has experienced these things. In fact, you know, people are not accurate in saying there are not enough extension officers in Africa.

When I was at the university, 15 percent of my class were training in agriculture to do extension work. The issue is, are those women willing to go and work in the village, in the mud? That is the issue. Just as we have very few people who become anthropologists and are willing to sit in the village, I think not everyone is suited to doing extension work and convincing the women.

The main reason, really, why there is a problem with extension is that a lot of the people do not speak the local language. If you go to the village and people do not have an education, are you going to use the measure on an American package of milk or fertilizer saying one cup, or are you going to translate it into a local thing meaning one gourd?

Mr. **Scheuer**. Why couldn't a woman do that? After all, lots of men don't like to go to work in the country, too. We have experience all over the world, including in this country. When men are trained to be doctors and so forth, they tend to want to work in the big cities.

In Africa—there are doctors in Africa, but they tend to concentrate in the big cities. There is one doctor per 500,000 population in rural Africa, but many more per unit of population in urban Africa. So that is a thread that runs through populations all over the world regardless of gender.

Dr. **Obbo**. Yes.

Mr. **Scheuer**. What I am saying is, assuming that you have to get a particular type of person, man or woman, to be an agricultural extension worker, and assuming they have to have language skills to communicate with a particular tribe, if we earmark those funds to require that half of those slots must be held open for women and that there must be an active outreach program to recruit properly trained and motivated women for those jobs, do you think that we would encounter resistance from those governments? Would we, in effect, be accused of cultural imperialism?

Dr. **Obbo**. No, I don't think you will meet resistance because I don't think it is cultural imperialism.

Mr. **Scheuer**. All right. That was my question.

Miss **Schneider**. Well, I think that we have the same kinds of questions that are on a similar plane in that we are suggesting that there be strings attached to some of the AID moneys that we are giving, that there be something comparable to environmental impact statements before different development projects are recommended.

In essence, I think that those recipients will be able to see the wisdom of our ways in making those recommendations, but I don't think that it is an attempt for us to impose unrealistic standards or requirements.

Well, I, unfortunately, have to run to another meeting. The only thing that I can say is that, Dr. Obbo, I found your example whereby the women had gotten together for the co-op and were doing all the work except they had to have a man do the bookkeeping and keep track of the money is oftentimes the comment that I hear when it comes to looking at why we have the problem with our own national debt. [Laughter.]

We are working toward bringing about those changes, but it is a slow process.

Thank you very much for your input today.

Mr. **Scheuer**. Congressman Bob Smith of New Hampshire?

Mr. **Smith**. I will have to see how all the women voted on that in the Congress. [Laughter.]

Ms. Smith, in your prepared testimony, you have three points at the end which you summarized—and it is the last page, page 11 of your testimony—you say that, just to quote the first one, "Direct USAID to strengthen the currently diminishing capacity of the Women in Development Office and strengthen the role of WID officers in African missions to ensure that women participate in all phases of program planning and implementation," et cetera.

That is very difficult to do, given the fact that we are dealing with a social structure that does not look upon its women the same way we do. Let's be honest. I mean, that is a fact. So it makes it difficult.

How are women in positions like the three of you are in, in the dealings that you have had with Africans, how are you received by the male population? Are you—I will be very blunt—are you looked down upon? Are you treated as an equal? How constructive are you in what you are doing, because of this problem? I mean, I think we have got to break that barrier down before we can get to the job at that, and I would like just your reaction to that. Anyone?

Ms. SMITH. I guess, to answer your question from my point of view, when I go out to the field, to, say, Senegal, into the rural areas, with—our staff, by the way, is multinationality, so it is not just U.S. folk. So the director of our Africa office in Senegal is a Senegalese development expert. But when you go out there, in terms of how men respond to you, it is not—maybe you are getting at the point that they perceive this is some sort of feminist force from the outside or something like that.

When we go out there, we are really talking about human resource development, and when we talk to the men or the tribal leaders—which we always do, because you need their support in order for women to have the kind of training we do—we are very cross-culturally sensitive about that, and because we have African women as part of our team from that country, the kinds of relationships that are established and how the whole community will benefit from the kind of training that women have, we have never really had any kind of tremendous conflict with men in the work we do, because the women demonstrate, when they have the opportunity to learn, that what happens is that the family and the community itself benefit.

I think the cross-cultural sensitivity and understanding the mores within a village and tribal structure and the language skills are absolutely critical to do that kind of work. But we have never had a problem with men.

Mr. SMITH. It just seems to me that—I know you would like to respond—it just seems to me that we need to do that as human beings, men and women——

Ms. SMITH. Absolutely.

Mr. SMITH [continuing]. Because that is better for the starving child, whether it be a male or a female.

Ms. SMITH. Exactly. The whole context of talking about women is in the sense of their role within the family. For Africans, the family is really critical. They don't see—I asked two African women at Nairobi, how do you look at this opportunity that women, you keep saying, ought to have in terms of men in your families? They said that they see it not as threatening their husbands and their families but rather, as offering women more opportunities within the society because, in the end, it helps their families and their communities. That rationale sounds pretty solid to me.

Mr. SMITH. Thank you. Respond if you like.

Ms. Huston. I was just going to mention that—a lot of people will not agree with me, but I always thought that the name or the title "women in development" gave a false idea of what we were really trying to get at, which is families, the welfare of families.

Ms. Smith. That is true.

Ms. Huston. "Women in development" was sort of called that because it was realized that they had been forgotten, and it was a way of calling them to mind. But it is not a separatist concept at all.

Mr. Smith. No, I agree. That is why I asked the question.

Ms. Smith. Absolutely.

Mr. Smith. My concern was whether or not calling it "Women in Development" was in fact working against you. I was just curious as to whether—if it is not, that is good.

Ms. Huston. My experience has been that I have never had any problem, I think, credibility issue in talking with men, again, if you are sensitive to their local customs and so on.

What I do plead for, however, is, in our AID policy, that we work more closely with the government leaders because, really, the people that have the influence to change the attitudes which are the barriers to women's participation are male leaders, and if they begin to speak out, it becomes more doable and more acceptable for husbands to permit their wives to go into training programs and become extension workers and so on.

Lots of times you find that the woman might want to participate, but in fact it would be viewed as rather outrageous for her to do so by her own family.

Mr. Smith. Thank you.

I know we have to vote, Mr. Chairman.

Mr. Scheuer. Yes. We have a roll call vote going on now, and we are going to ask you some questions by mail. [See appendix.]

But I have one question to ask you, since we have a piece of legislation coming up this afternoon on which you can give us some advice. We had a change last summer in the USAID policy on family planning. It had been based for many years on voluntarism and informed consent.

Ms. Smith. Correct.

Mr. Scheuer. As stated in the 1982 policy paper on population assistance, all USAID-supported population programs must demonstrate that they are free of coercion regarding not only the practice of family planning but also the choice of methods.

Now, that meant that organizations that were offering only natural family planning, which is periodic abstinence, would be required to provide information on all other available and effective choices, and that if they did not choose to offer that, they would be required to refer women to other agencies that would inform them about all their available choices.

Now, on July 8 of this year, that was changed so that agencies offering only natural family planning would not be required to inform women as to other contraceptive options available, nor would they be required to refer women to other family planning projects and programs that did.

A number of us are putting in an amendment this afternoon that would require any AID recipient that provides only natural family planning to continue the process of referring, if they didn't wish to provide information on other services, which would require them to refer women for that additional information and to extend her knowledge to other family planning agencies.

Do you support the change that took place last July, or would you support the amendment that a number of us are introducing this afternoon requiring that any agency that provides only natural family planning must refer women to other agencies for information on all of the available contraceptive options?

Ms. SMITH. Well, I am sure everybody here will probably agree. I know I personally think that your amendment is absolutely needed, and it is a disservice to women to not let them have the information to know what the options are across the third world.

Mr. SCHEUER. Dr. Obbo?

Dr. OBBO. I think that if you don't have the amendment, you might as well forget about family planning programs.

Mr. SCHEUER. Ms. Huston.

Ms. HUSTON. Say no more.

Mr. SCHEUER. You think they have said it all?

Ms. HUSTON. Absolutely.

Mr. SCHEUER. All right. It has been a very informative panel. We thank you very much for waiting until the end of the morning. We have gone way past our time, and we thank you for your patience and tolerance.

Ms. SMITH. Thank you. We appreciate your sticking with us.

Mr. SCHEUER. The hearing is adjourned.

[Whereupon, at 12:31 p.m., the subcommittee recessed, to reconvene the following day, Thursday, October 31, 1985.]

AFRICA AND HUNGER: PROSPECTS FOR SUSTAINABLE DEVELOPMENT IN SUB-SAHARAN AFRICA

THURSDAY, OCTOBER 31, 1985

House of Representatives, Committee on Science and Technology, Subcommittee on Natural Resources, Agriculture Research and Environment,
Washington, DC.

The subcommittee met, pursuant to call, at 9:45 a.m., in room 2318, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Mr. Scheuer. The fifth hearing of the Subcommittee on Natural Resources, Agriculture Research and Environment will come to order. The fifth committee hearing on this awesome subject of hunger and death in sub-Saharan Africa.

Today, we have a very distinguished panel, and we are sort of having a round-up, a skull session with some of the finest brains available to take us to the mountaintop, so to speak, and tell us from a holistic point of view what is wrong and what the donor countries, as well as the nonprofit private agencies, ought to be doing.

We have examined over the last 4 days the relationship between climate, population pressures, environmental degradation of all kinds—of soil, of grasslands, of croplands, of forests—the appalling phenomena of desertification and deforestation—all of which sort of culminate in significantly declining levels of per capita food availability. The great problem facing us is how to restore equilibrium between food and people, and that really means how do we come to terms with people and the environment—the global environment in which we live.

I think one thing on which we are clear, the majority and the minority here, there are a lot of things on which we stand together where there is very little politics in this tragic problem. One thing I think on which we are pretty well convinced is that solutions must be long term. The Band-Aids, the palliatives, the shipments of emergency food are right, they are decent, they are moral, they are an answer to an immediate emergency situation. But if we only do that we fail the Africans and we fail ourselves. We fail all the precepts of thoughtful, intelligent charity, all the precepts of the Judaeo-Christian beginnings on which our country is based of giving on an intelligent humanitarian basis. Not to give the fish, but to teach how to fish. Not to give the loaf, but to teach how to bake the loaf.

So this is the reconciliation that we seek, the ability of people to live in harmony with their environment, with food self-sufficiency and the ability to produce health care, shelter, food, employment, education; literate, productive happy populations.

Today, as I said, we have an enormously impressive panel. Hopefully the witnesses will identify for us actions which Congress and the international donor and nonprofit private community can take to promote sustainable development in sub-Saharan Africa. Sustainable development including research and vast programs of technology transfer to make available the fruits of this research of all kinds to the people who need them.

Before we introduce the witnesses, I would like to recognize my distinguished colleague from Rhode Island, Congresswoman Claudine Schneider.

Miss **Schneider**. Thank you, Mr. Chairman. And I welcome Mr. Brown and our other witnesses today. I think that we have already embarked upon a series of very productive hearings that have focused on a number of issues that deal with the problems in Africa. We have already had testimony on some of the important factors leading to climate issues and long-term climate trends. We have discussed African population dynamics and some of the appropriate research and policy options that are needed to respond to Africa's family planning needs. We have also discussed the role of new and innovative and appropriate technologies that would enhance Africa's food production systems for the future.

So I think that we need to look even at greater depth at some of the various factors that are responsible for Africa's falling food production.

The present dimensions of the tragedy in Africa certainly require that we have important relief efforts, but we are particularly interested in this committee here today in some of the near-term and particularly long-term solutions to the problem. I think that to focus on the long-term solutions is critical, and as we look at the environmental ramifications we see that they keep leading back to the source of the difficulties.

Some of the possible long-term recommendations come from a wide range of distinguished witnesses over the past couple of days, and I believe that the witnesses today are certainly more than qualified to address some of these recommendations and to provide us with some thoughtful insights on their own ideas as to long-term solutions for the future.

I believe that the Environmental and Energy Study Institute recommendations can certainly help us address some of the critical natural resource and development issues facing developing countries in Africa, and they certainly warrant a great deal of consideration. I very strongly believe that we need to press forward with legislation to help strengthen developing country environmental authorities, that we need to look more closely on how we can improve environmental and related program research and development activities; and there is very little question in my mind that we have to enhance environmental and related development training efforts and to review international natural resource programs with a wide range of U.S. Federal agencies.

The OTA report on international environmental issues I believe stated that it is incumbent upon our country to move forward with appropriate extension and training programs that can help foster and encourage the role of women in agricultural food production in Africa. And I think that we also need to examine our family planning programs and ensure that they are compatible with the cultural and social mores of the various African countries.

On my recent trip to Africa it became quite clear to me that one of the overwhelming demands on the part of not only the women but also the men was that the need for information seem to be one of the most pressing needs. The technological and informational solutions as to family planning, as to managing resources, as to dealing with some of the energy challenges were foremost on people's minds. And I think that we have a real opportunity now to retrofit, if need be, some of our aid programs and to make sure that not only the taxpayers in this country are getting their money's worth by providing assistance to developing nations, but also we assure that those Africans that we are attempting to help are genuinely receiving the kind of assistance that is in their best interests, both near and long term.

So I thank you, Mr. Chairman, for the opportunity to participate in these hearings this morning. I look forward to the witnesses in assisting us to deliberate on some of these important international environmental problems, and I think that we are going to have a most provocative hearing today.

Thank you very kindly.

Mr. SCHEUER. Thank you very much, my distinguished colleague.

We will now hear from Lester Brown, president of the Worldwatch Institute. Those are very hollow words with which to describe Lester Brown, for all of those in our work who know of his work and his life. It is hard to describe the contribution that he has made.

He has served as project director of the institute's Annual State of the World Report. He has served as the administrator of the International Agricultural Development Service of our own Department of Agriculture. And he is the author of several books that have become classics in the field, including World Without Borders, By Bread Alone, The 29th Day, and Building a Sustainable Society.

I can say above and beyond that that Lester Brown has been the housemother for those of us like Claudine Schneider and myself, and a host of other Members of Congress, who are trying to grapple with these enormously challenging and heart-rending issues and trying to bring the intellectual resources of the Congress and the financial resources of our country and the most important resources of all, the resources of compassion and decency and caring of the American people into some kind of logical focus on these problems. He has had an effect on our thinking and on the development of programs that has been incalculable.

So on behalf of all of us, Lester, those Congresspeople present and far many more of them who are not here this morning, let me express our gratitude to you for the time and effort that you have extended over the years in guiding us, counseling us, advising us, and extending your wisdom and judgment for the benefit of our work, and hopefully the American people and the people of these poor, beleaguered Third World nations.

With that and without further ado, let me tell you and all of the other witnesses that your prepared testimonies will be printed in full in the record. And what we would ask you to do is to chat with us informally, as if we were all in your living room, talk to us for 6 or 7 minutes and then we will have a chance to ask you some questions.

Lester Brown. Please proceed.

STATEMENT OF LESTER R. BROWN, PRESIDENT, WORLDWATCH INSTITUTE

Mr. BROWN. Thank you, Mr. Chairman.

My comments will be brief, and if it serves the purposes of the committee, I would like to submit the paper that we did on Reversing Africa's Decline a few months ago for the record.

Mr. SCHEUER. We will probably have to excerpt it for the record.

Mr. BROWN. Then I will leave that to you. Whatever serves the purposes of the committee will be fine.

In the fall of 1978, there was a report from the AID Mission in Addis Ababa, Ethiopia, which indicated that Ethiopia was losing 1 billion tons of topsoil a year. Now, to any agronomist who saw that report, it would be clear that Ethiopia was headed for trouble. The only question would be, when?

For most people, 1 billion tons of topsoil is an abstraction, it really doesn't mean very much. It was not until about a year ago, when NBC carried the footage of starving people in Ethiopia, that soil erosion acquired a human dimension. It suddenly began to mean something in a way that it had not before.

I use that example of Ethiopia because I think it encapsulates what is happening in Africa now. We look at the ecological indicators, whether it be soil erosion, deforestation, or rangeland degradation, across the board. We have not been able to find a single country in Africa that has a positive ecological indicator. They are all either neutral or show signs of moderate or rapid deterioration.

I could go over the figures on the food situation, which you know well. Last year, 140 million of Africa's 530 million people were fed entirely with grain from abroad. This year, 1985, it will be something like 170 million we estimate. Not only is grain production per person declining in Africa, but income per person is declining. Debt is now $170 billion, external debt. And what we are seeing in Africa for the first time, at least in the modern era, is a continentwide deterioration in the environmental support systems on which the economy depends. And as we have noted in the past, when the environmental support systems begin to deteriorate, it is only a matter of time until economic deterioration follows.

We are also beginning to understand better the process of ecological decline and exactly what is involved. The process seems to begin with an excessive loss of tree cover. And again I won't go into detail, but as the tree cover is lost, you interrupt the nutrient cycling that the trees provide; then when wood becomes scarce, you start burning cow dung and you start burning crop residues, as has been happening in Ethiopia now for a number of years, and you interrupt two more nutrient cycles.

Then organic matter begins to decline, the capacity of the soil to resist erosion decreases, and the rate of soil erosion crosses the threshold of the rate at which new soil is formed. In sort of the final stage, the hydrological cycle is affected, and the amount of rainfall that runs off increases, the amount that is retained decreases, and this leads both to a reduction in aquifer recharge of underground water supplies and a reduction in evaporation to recharge clouds.

In looking at the debt situation in Africa, it looks to us as though declining rainfall has had a greater effect on debt than rising oil prices; and this is the only region in the world where this is the case. In looking at Africa's external debt, one of the factors that has been driving it has been the shift in the food situation. As recently as 1970, Africa was essentially self-sufficient in food. In 1972, food imports totaled $600 million. By 1983, they were $5.4 billion, and they are much higher than that today. At the same time, the environmental deterioration and the decline in rainfall have reduced export crops. So the need for imports has increased and the availability of exports has declined.

The African debt situation is belatedly beginning to get the attention of the international financial community. The focus until recently, has been on Latin America, which is larger. Latin America's debt is twice as large as Africa's, but the African debt is probably far less repayable than that of Latin America.

In sort of looking at what needs to be done, and I am using shorthand to sketch out the problems. In looking at what needs to be done, it seems to us that we are now at a point in Africa where the use of economic criteria for shaping development strategy are no longer adequate; that is, the traditional project rate of return, for example, for allocating foreign assistance. It's just not—it's no longer appropriate for Africa. The only development strategy that will work in Africa is one that begins by asking how do we restore the resource base on which the African economy depends, and that includes restoring tree cover, conserving soil, restoring grasslands, restoring the hydrological cycle itself. This is a far more challenging effort than anything we have come upon before at the international level.

In looking for an analogy in terms of what needs to be done, we were looking back historically and thought of the Marshall plan, and then realized that while the Marshall plan was a very large international initiative, it didn't come close to what needs to be done in Africa. The contrast is dramatic because in Europe the institutions and the skilled populations were already in place. What was involved was rebuilding a physical plant that had suffered from war devastation. In Africa, we have a continent that has to be rebuilt as a result of ecological devastation, but we don't have many of the institutions and we don't have many of the skills in place. That is why the efforts of the international development community become so important, and groups like the Peace Corps, for example, which we will be listening to shortly.

The things that hold the key to reversing the decline in Africa are basic grassroots things like planting trees, planning families, building conservation terraces—things that are people intensive and not capital intensive. That is not to say that Africa will not need far more capital in the future, but it is not the traditional sort of World Bank approach of throwing $100 million of the project here and $300 million there. Rather, it is organizing people to plant trees and plan families on a scale and with an urgency that has not been undertaken anywhere before.

And my sense is that there is still a feeling on the part of many people that Africa has had a drought and that the drought is ending, that things are going back to normal and we can relax. That is not the way we see it. In looking at the ecological indicators they are negative consistently across the board for Africa. We do not see anything in prospect at the moment to arrest and reverse the deterioration that is underway; indeed, driven by a population that is expanding at 3 percent per year, twentyfold per century. We see things getting much worse in the years ahead, and the experience of the last few years is just sort of the first wave in waves of increasing intensity that we will be experiencing between now and the end of the century.

These are the main points that I think need to be made. One further point. On the agricultural price policy, we have a situation where the great majority of governments in Africa have been following agricultural price policies that are consumer/urban oriented, not farmer oriented, and so we haven't had the encouragement.

The one country that is doing quite a few things right and that I think may become a model for other African countries is Zimbabwe. On the family planning front, more than 30 percent of the women in Zimbabwe are now practicing family planning, using contraceptives. Indeed, when I was in Zimbabwe last spring, I was told by the AID Mission director that the government of Zimbabwe had requested an emergency air shipment of contraceptives because the demand for family planning services was rising so much faster than had been anticipated that they were almost out of supplies.

On the agricultural side, Zimbabwe has a very good agricultural price policy and the small farmers on the homelands are now responding to those price incentives in the same way that the European farmers have been for a long time. And what this has led to this year, with rains being close to normal in Zimbabwe, is a surplus of 1 million tons of grain, about half of which they are putting into storage as a food reserve and about half of which will be exported.

So I cite the Zimbabwe example just to say that Africa is not hopeless, but it is going to take a lot to turn the situation around.

Thank you.

[Excerpt of report follows:]

NEWS RELEASE

HOLD FOR RELEASE
6:00 P.M. EDT
Saturday, June 29, 1985

REVERSING AFRICA'S DECLINE

Traditional development strategies in Africa are failing, and without a broadbased effort to restore and preserve natural support systems, Africa has little hope of reversing its environmental deterioration and economic decline, according to a new study by Worldwatch Institute, a Washington-based research organization.

"Narrow economic criteria, such as the rate of return on project investments, are no longer adequate. The continuation of a 'business as usual' approach to Africa by the international development community is to, in effect, write Africa off," said Lester R. Brown, President of Worldwatch, and co-author, with Edward C. Wolf, of the study, Reversing Africa's Decline.

The study, sponsored by the United Nations Fund for Population Activities, outlines a development strategy to restore the economy's deteriorating environmental support systems--forests, grasslands, soils, and the hydrological regime. The authors said that population growth, the fastest ever recorded, is driving this change and disintegration.

- more -

CONTACT:
David Macgregor
(202) 452-1999

Worldwatch Institute

1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036, U.S.A.

"Reversing Africa's decline will require national efforts to organize millions of people to plant trees, build soil conservation terraces, and plan families. Such a strategy will, of necessity, be people-based rather than capital-based. More capital will be needed, much more, but the heart of the reversal strategy will be the mobilization of people," the authors said.

Brown and Wolf described famine and the threat of famine as "among the most obvious manifestations of a failed development policy." Their report found that since 1967, grain output per person in Africa has fallen by nearly a third. Income per person has fallen by a fifth since 1970. Starvation deaths have passed the one million mark, and some 10 million villagers have left their homes in search of food, many of them crowded into hastily erected relief camps.

"Africa's ecological deterioration and economic decline are swelling its foreign debt. The region's cereal import bill, multiplying ninefold since 1972, claimed some 20 percent of total export earnings in 1984. Meanwhile, creditors are beginning to wonder whether the continent's debt, projected to reach $170 billion by the end of 1985, can even be serviced, much less repaid," Brown and Wolf said.

Understanding recent trends in Africa requires an understanding of how changes in the continent's ecology, climate, and economy reinforce one another, the authors said. The loss of tree cover, for example, triggers a cascading decline of biological and economic productivity. As trees disappear, firewood becomes scarce, and villagers begin to burn crop residues and cow dung. This in turn reduces soil fertility, leading to yield declines.

As soil structure deteriorates and vegetation diminishes, soil erosion accelerates and rainfall runoff increases. As the rainfall returning to the

- more -

ocean increases, less remains to be re-evaporated into the atmosphere. Eventually rainfall begins to decline. Ecological deterioration and declining rainfall reinforce each other, forcing economies into decline and pushing them toward eventual collapse.

The authors ask whether almost two decades of depressed rainfall is a temporary decline or a new long-term trend. "If the dryness of the last 17 years is temporary, exclusively the product of oscillations in global atmospheric circulation of the sort that have caused droughts historically, then governments should concentrate on emergency food relief while waiting for the rains to return. If, however, population-induced changes in land use and soil degradation are gradually reducing average rainfall, then far more urgent and ambitious measures are needed," Brown and Wolf declared.

Africa's population is projected to roughly triple by 2025, reaching 1.5 billion, according to the Worldwatch report. Some African political leaders have begun to speak out on the need to slow population growth. A few countries, such as Zimbabwe, have launched effective family planning programs. In early 1985, the report noted, the rapidly expanding use of family planning services in Zimbabwe outstripped projected demand, leading the government to request an emergency air shipment of contraceptives from the United States.

The World Bank estimates that adoption of a "rapid" fertility decline goal in sub-Saharan Africa would require a twentyfold increase in expenditures by the end of this century. Brown and Wolf said that requests for African family planning assistance to the International Planned Parenthood Federation, the United Nations Fund for Population Activities, and the World Bank have soared over the last 18 to 24 months.

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Soil erosion and land degradation are now affecting harvests throughout Africa, from the Mediterranean fringe to the Cape of Good Hope, the report found. Over 40 percent of Africa's people now live in countries where grain yields are lower than they were a generation ago.

"Kenya, which launched an effective soil conservation program in 1974, has encouraged farmers to terrace sloping land by leaving unplowed strips along the contour," the authors said. These terraces retain water and soil nutrients, visibly raising yields on their upslope side, thus enhancing the income of conservation-minded farmers. In 1977, Ethiopia, faced with a heavy loss of topsoil, followed with an even more ambitious program to construct soil-conserving terraces and plant fast-growing trees, relying on the Peasant Associations and using 'food for work' aid."

The loss of tree cover in Africa, both in closed forests and in savanna settings, is extensive, the report found. The coastal forests of West Africa, which may play a key role in recycling rainfall inland, are unlikely to last until the turn of the century. A few countries, such as Mauritania and Rwanda, are now nearly treeless. Elsewhere, wood collection for fuel and other uses exceeds the sustainable yield of remaining accessible forests. In Kenya, demand is five times the sustainable level; in Ethiopia, Tanzania, and Nigeria, demand is 2.5 times the sustainable yield; and in Sudan, it is roughly double.

"Restoring African woodland and forests is essential to the recovery of agriculture. It calls for unprecedented efforts by African governments and international donors to assist millions of families who will do the bulk of the planting, maintenance, and forest management. The 380 million men, women, and children in the African countryside comprise the only labor force large enough to reforest Africa," the authors said.

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One reason for Africa's agricultural disappointment, according to the authors, is the expectation that dramatic advances in grain production that began in Asia some two decades ago could be repeated. "Unfortunately, the Asian formula cannot be transferred to Africa. In Asia, a single package of successful yield-raising technologies for rice could be easily adapted for use throughout the continent. Africa, by contrast, depends on several food staples--corn, wheat, sorghum, millet, barley, and rice among the grains, plus cassava and yams--and a highly heterogeneous collection of farming systems. No one technological package will work for more than a small segment of the continent's farm sector. As a result, the research investment needed to achieve a given advance in farm output in Africa may be far greater than in Asia or North America."

A reorientation of food price policies offers the most promise for quickly raising agricultural productivity, the authors said. Government-backed farm price supports can reduce market uncertainty at harvest time, which will encourage investment at planting time. Zimbabwe, one of the few African countries with effective farm price supports, will be exporting over a million tons of corn in 1985.

"The effort required to avert economic collapse in Africa recalls the Marshall Plan that revitalized Western Europe after World War II, but it will be far more difficult," Brown and Wolf said. "In Europe the needed institutions and human skills were already in place, only the physical plant needed to be rebuilt. By contrast, Africa does not yet have all of the institutions and skills needed to reverse the decline."

"The mobilization of human and capital resources called for is perhaps more like the emergency mobilization of the Allied Powers in the early forties, which required quick action, unity of purpose, and a common appreciation of why sacrifices were needed."

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Brown and Wolf said that the United States, which led the postwar reconstruction of Europe, "has not confronted the environmental causes of Africa's crisis." At the international level, they said, only the World Bank appears to be institutionally strong enough to lead such an effort. "But its experience lies primarily in financing large-scale development projects, not in local mobilization of the kind needed in Africa. If the Bank could make this adjustment, it could lead the effort to get Africa moving again."

Policymakers who confront the possibility of a deteriorating climate also face the reality that per capita grain production is steadily declining in Africa, and that national economies are disintegrating, the authors said. "Any effort to reverse these interwoven trends must be undertaken quickly. The further the relationship between people and natural support systems unravels, the more difficult it will become to reverse Africa's decline."

"The greatest risk in Africa is that there will be a loss of hope. However bleak the deteriorating situation may appear, it is of human origin and can yield to human remedy. How African leaders and the international community respond to the challenge will reveal much about the human prospect over the remainder of this century and the begining of the next one."

- End -

FOR MORE INFORMATION CONTACT:

Lester Brown	202/452-1999 (office) 202/328-6256 (home)
Edward Wolf	202/452-1999 (office) 202/966-6630 (home)
David Macgregor	202/452-1999 (office) 202/667-8313 (home)

Mr. **Scheuer**. Thank you very much, Lester.

This is not a question, because we are going to have to suspend for a few minutes. We have a rollcall vote that just came on as you were speaking, but it is an observation. A number of Members of Congress have been meeting with top World Bank officials, from Tom Clausen on down: Ernie Stern, the executive director, John North, the head of the Health and Population Division, and so forth. We have been meeting regularly for the last few years a couple of times a year. Our basic thrust is that we would hope that would get more actively involved in financing these people-oriented activities that are people intensive and not capital intensive, especially family planning services.

It seems one of the important factors in explaining why there hasn't been an expansion in family planning services and other kinds of things that are people intensive, the kinds of things you have described, is that these countries are reluctant to make applications for loans because they can't see the flow of hard cash coming from these activities that will service the loans. They are used to applying for financing for a pulp and paper mill or for a petrochemical activity or even a farm-to-market road. When it comes to financing ecological or environmental projects that would enhance the farmlands, enhance the grasslands, involving tree planting, and so forth, family planning, they can't see a stream of cash emanating from those programs that would service the loans. They have been very slow to make applications. So maybe there has to be some kind of an approach on the part of the World Bank. Maybe they have to use soft loan money and reduce interest rates or in some way make these loans in the form of grants, which is what they are when you get down to subsidized loans of 1 or 25. In effect, they are grants, and we are all kidding ourselves when they call them loans. Maybe we just have to abandon the idea that these loans have to be, have to justify themselves as commercial loans. Maybe we just have to understand that so much wreckage has taken place that we have to make simple, basic investments—long term investments—in the land—the grasslands, in the croplands, in the trees, in the forests, and in the people—that will not show any immediate return, but all of which taken together 10, 15, 20 years down the pike will show a quantum jump in producing a society that has a livable balance of resources and people. That may be a job in which we are all engaged with the international financing agencies, both the World Bank and the IMF, as well as the regional development banks.

Now that doesn't come out of anybody's time. That is just a simple observation.

Do you have an observation before we leave?

Miss **Schneider**. No observations at this time.

Mr. **Scheuer**. OK. We will suspend for about 15 minutes while we take off to make this vote. And I am sure we will have some more questions for you, Lester, if you can stay.

Mr. **Brown**. Thank you.

[Recess.]

Mr. **Scheuer**. Congresswoman Claudine Schneider of Rhode Island is recognized for 5 minutes.

Miss Schneider. Mr. Brown, I wonder if you have had the opportunity to look at the AID budget of late, and I wonder what your assessment would be as to whether or not you feel there is an appropriate balance of some of the more large-scale development cash crops mixed in with some of the various low technology projects such as aquaculture development and some of the mixed garden techniques. Have you had the chance to review——

Mr. Brown. I have not had a chance to look at the overall AID program. My sense is that AID and the World Bank are both beginning to recognize the need to move in some of these directions, but are not altogether certain about how to do it. And I know at the Bank they are sort of thinking out loud about how the Bank can get at some of these grassroot sort of activities. Because in the traditional relationship it is the Bank-to-government relationship with some technical advisers for some of the large projects.

I was saying earlier that I think the development effort that is needed is much more organizing people; it is much more almost a Peace Corps approach to things than the traditional capital intensive approach.

In looking at the things that have worked in other countries at the grassroots level, I think perhaps the outstanding model in reforestation would be South Korea, which since 1972 has had some—literally planted an area in trees, mostly barren land, and hillsides that had been denuded in an earlier period. That is about two-thirds the area in rice, which is the national food staple. There has been a greening of Korea, and what they have done over the last 12 years using a village-level reforestation-focused program is not only reduced soil erosion and increased water retention, but they have also created an energy resource that will be there for decades to come.

Miss Schneider. I think there is very little disagreement that that is, you know, the way to go. But I was just wondering if in your assessment of our AID programs, if you found that that adequately reflected those kinds of programs, both labor intensive—reforestation projects, aquaculture projects, that sort of thing?

Mr. Brown. Right. I haven't looked at the budget for some time, but my guess is that it does not.

Miss Schneider. I wonder if—the OTA report, have you had an opportunity to see that, by chance?

Mr. Brown. On Africa?

Miss Schneider. Yes.

Mr. Brown. Um hum.

Miss Schneider. Well, I think that one of the changes included in their recommendations was to ensure that U.S. foreign assistance had some long-term projects and that there was a more clear definition of goals and also objectives over the long term, and that those be clearly defined and formulated. Could you just give me your thoughts on that proposal or recommendation?

Mr. Brown. Well, one of the things that is lacking in Africa is any sense of where things are headed and what the consequences will be of continuing on the current path. I think what is desperately needed for Africa is an African counterpart of the Global 2000 study that would look at Africa, that would try and project trends. And not just economic trends, but the resource trends.

What happens to land productivity if the soil erosion rates of the past decade continue to the end of the century and beyond? What happens to the hydrological cycle if the rate of loss of tree cover of the last decade continues, for example? And sort of sketch these trends out so we can look at the environmental support systems and the economic trends together and see where they are going. That I think could then begin to provide a framework and a backdrop against which we could, various groups including AID, for example, could formulate a long-term strategy. Until we have that it is going to be very difficult for African Governments or international development assistance agencies to have a clear idea of what the urgencies are and what the priorities are and which way things ought to be going.

I suppose the model for that at the national level would be the exercise in China, as part of the post-Mallory assessment, when they projected their economic and resource trends, including population to the end of the century. That became a basis for an entire restructuring and a shifting of priorities, and, indeed, provided the information base, the public education, that permitted them to launch the one-child family program, for example.

Miss SCHNEIDER. There is increasing enthusiasm for the private sector playing a greater role in helping to bring about or to reverse some of Africa's decline. And I wonder if in your daily efforts, if you are much involved with the private sector and to what degree in helping to bring about these changes, being they nongovernmental organizations or businesses or whatever. What are you doing these days insofar as helping to turn the situation around?

Mr. BROWN. One of the difficulties that private businesses face in Africa in trying to make a contribution of any kind is simply the lack of infrastructure that exists there. My sense is that in many African countries there are economic activities that have been undertaken by parastatal bodies which have become extraordinarily bureaucratic, inefficient, and in many cases corrupt. And it seems to me that turning these some of these responsibilities to the market, returning them to the market would probably do a great deal to increase the efficiency of economic activity in Africa.

In terms of the private sector, I think some of the interesting work being done in Africa is being done by the private voluntary organizations in such things as reforestation, for example.

Miss SCHNEIDER. Right.

Mr. BROWN. But what is needed in country after country is a game plan within which the various groups from the outside, whether they be voluntary agencies, international assistance agencies or private corporations, can fit in. At the moment those strategies simply do not exist.

Miss SCHNEIDER. Well, in essence, you have provided strategy right here. I mean I read this sometime ago, I guess when it first came out, and so I was wondering what kind of distribution efforts you have and are there any organizations or groups that have said: "Terrific, Lester, we've got the game plan, now we're going to move ahead and do something."

So is there any—it looks like you have done much of the, you know, intellectualizing and development of the direction, and I just wonder what is your role actionwise from there?

Mr. **Brown**. Well, one of the surprises to us was the response of the World Bank to this study. This study says the time has come to abandon the traditional economic criteria for shaping development strategy and instead turn to environmental criteria, and I had assumed that would be anathema to the World Bank. Even before the study was out, the Bank requested permission to translate into French for the 22 French-speaking countries in Africa, and they have purchased and distributed 900 copies——

Miss **Schneider**. Terrific.

Mr. **Brown** [continuing]. Of this within the Bank. I think every professional in the Africa Division has a copy of this study. We were invited to do a seminar there a few weeks ago; and again I thought there would be 25 or 30 people and there were 130 people, which meant it was no longer a seminar.

So I think the Bank is clearly and is publicly indicating that things have not worked very well in the past and they are prepared to rethink things, which is no easy thing for a large organization like the Bank to do. I mean major course corrections don't come easy.

Miss **Schneider**. OK. Thank you very much.

Thank you, Mr. Chairman.

Mr. **Scheuer**. Another observation, and this is not in anybody's 5 minutes.

We had a hearing sometime in the last year on a development project in the Amazon Basin. We had Brazilian environmentalists up here, both government and nonprofit. I guess they were all in the nonprofit sector, some of them had been in government before. And they described to us in detail the environmental madness of this project to invade the Amazon Basin, clear it, engage in vast planting of plants that weren't appropriate for that area, bringing in outside area. It was destroying the Mesquite Indians. I think the tribe was and it was just an environmental and ecological human nightmare.

We wrote a long letter to Tom Clausen, head of the World Bank, describing this and saying that they ought to have—they ought to exercise some oversight over this project; that in the contract itself there was a provision that the project should be environmentally sound and so forth, and that this was being grossly contravened by the Brazilian Government, who was sponsoring this project, and within a month or two that project was suspended never to start again.

So the World Bank is beginning to be on the qui vive let us say; it is beginning to be very sensitive and environmentally aware. Tom Clausen and Ernie Stern, the director of the World—Tom Clausen, the president, and Ernie Stern, the director, are two very, very well-meaning, highly able, very sophisticated, very knowledgeable, and very sensitive, now, to these environmental and human problems; and they are trying to move the Bank into new uncharted areas. I think part of what we have to do is bring these problems to their attention at a top level. I think given the chance and given the information that they are in a position to make changes, and they will make changes.

We found that our little subcommittee has just killed that project deader than Julius Caesar in the matter of a couple of months just by documenting the problems and presenting them in a workman-like, noncontroversial way to the proper World Bank authorities through our Treasury Department representatives on this particular project. Well, that is my observation.

A couple of questions. The Brazilian project is typical of projects in the past that have been financed by the World Bank and the IMF where environmental and ecological considerations and many human considerations have been left unexamined or, if they have been treated in the contracts, it is in the fine print and there has been very little followup and so forth.

Would a stronger concentration on environment assessment in the beginning of the project and then repeated systematic environmental evaluations of the actual results of the project, intended or unintended, help improve the environmental and ecological soundness of many of their development projects, in your view?

Mr. BROWN. I think we have reached the point where we have to go beyond the environmental assessment, the environmental impact sort of statement. I think what we need is a development strategy that is an environmentally integrated, environmentally sound development strategy that starts with the environment and then works from there. Then you don't have to worry about the impact statement. The impact statements are always sort of an appendage and they never are central. What we need now are development strategies that are environmental development strategies, and this I think is a much more fundamental concept.

Mr. SCHEUER. Yes. All right, one last question, Mr. Brown.

You mentioned the experience of Zimbabwe and family planning. That the demand far outpaced the supply of contraceptive materials and that the President—the Chief of State actually requested us to fly in contraceptives. I quote from page 37 of your marvelous Worldwatch paper.

> Family planning programs that work best offer a full range of contraceptives and sterilization for both males and females. The more kinds of contraceptives offered, the more likely couples will find a method that meets their particular needs. When couples are satisfied with a contraceptive method continued use is far more likely.

OK?

Incidentally, I am going to ask this question of all the witnesses this morning, so for any of you that are in the room, if you would listen for a moment, you might be thinking about this.

Now, for many years it has been the policy of AID in financing family plannings overseas that when they financed a program offered mainly or mostly or entirely abstinence or natural methods, they would require that sponsor, and generally it was a Catholic Church-sponsored project but not always—they would require that sponsor to counsel the women, the men, that other contraceptive options were available. If they didn't wish to counsel them on the specifics of other options then they would refer them to another agency.

Now, on July 8 of this year that policy was changed, so that sponsors who advocate abstinence or the rhythm method are no longer required either to discuss other options or, in the event of their unwillingness to do that, to refer clients, young couples, young women and men, to other agencies where they could get the full advice on the full range of contraceptive options available.

Now, the three leading women Members of Congress—Pat Schroeder, who is chairman of the Caucus on Women's Issues; Olympia Snowe, who is the vice chairman; and Nancy Johnson, who is a Member—plus a substantial number of other Members, including both my colleague and myself, yesterday put in an amendment to the foreign aid bill which would mandate that in the event that a sponsor of a family planning program wished only to provide information on abstinence and the rhythm method that they would now be again, as was the policy before July 8, 1985, be required either to explain all of the other contraceptive options available. In the event that they didn't feel that this was appropriate or acceptable to them, they would at a minimum be required to refer young women or young couples to other agencies that would explain to them the vast array of contraceptive options.

Now, my question is, in view of your emphasis in your report that the family planning works best when a full range of contraceptives and sterilization is offered for both men and women and in view of your comment about Zimbabwe where they urgently needed the import of contraceptives—and I take it they weren't talking about the import of abstinence—what would your view be on the change of policy of the AID program of last July 8? What would your view be of the introduction of an amendment yesterday by a group of Congressmen that would seek to change the policy back to the pre-July 8, 1985 policy?

Mr. Brown. In looking around the world at family planning programs, I don't think one can miss the fact that the family planning programs that work well are those that use the cafeteria approach, providing the entire range of services to suit the particular needs. And needs do vary depending on where couples are in the childbearing cycle and whether they want to space children or not have any more children. There are individual preferences to consider.

So I think my point again would be even more fundamental, which is that I would discourage any family planning programs that offered only one particular approach and would push for offering the cafeteria of services. I think it is a disservice to those who come to a family planning clinic to be offered only one particular solution when no one will serve all the needs. So I think it is a disservice to the potential users of the service. And second, I think it is wasteful. Because to the extent that you fragment the program and set up individual ones, you are wasting taxpayers' money. And as a taxpayer, that is one of the things that I would be concerned about as well.

So I would certainly hope that the Congress would return things to the pre-July 8 situation because it doesn't make sense to fragment the program in either terms of the quality of service or the return to taxpayers' money.

Mr. Scheuer. In a recent visit to Africa, in 1978, I met Father Pere Boot, who is head of the Department of Demographic Statistics at the University of Zaire. He is a Jesuit priest, and he is the driving force behind family planning in Francophone Africa. He took me to a number of family planning clinics in Zaire, in Kinshasa, that were run by nuns, several of them from the New York City area. They offered the full array of family planning devices and systems. So apparently this is possible.

I have outrun my 5 minutes, and I would like to introduce Congressman Ben Gilman, who is not a member of this committee. He is a member of the Foreign Affairs Committee. We invited him to come to this set of hearings. I think no Member of Congress has had a more thoughtful, more creative, more productive involvement in the entire range of questions raised by hunger and starvation in Africa than Congressman Gilman. And I would like to extend our heartiest welcome to him today, with the hope that he will come to additional hearings of this kind, and with our profound congratulations of recognition of the marvelously creative, outstandingly fine role that he has played in this whole matter.

Congressman Gilman.

Mr. GILMAN. I thank the gentleman from New York for his kind words, and certainly want to commend him and the ranking minority member, Claudine Schneider, for bringing about this hearing and helping us focus attention on some of the more important aspects of the future of Africa and some of the long-term solutions. I certainly find it a great deal of pleasure to be able to listen to and read some of the comments made by Lester Brown, who has done such an exemplary job in focusing our attention on some of the long-term solutions.

I want to commend you for the Building A Sustainable Society which gave us all a lot of thought in the Congress and helped to stimulate my interest in some of the long-term solutions, and your recent Worldwatch paper on Reversing Africa's Decline.

Mr. Chairman, if I might just inquire of—one question, and I will be brief.

Mr. Brown, OTA has begun a study in some low resource agricultural developing countries in order to aid Congress in its work concerning the domestic agriculture and our foreign assistance policy. The study will continue the work begun by OTA's Technical Memorandum entitled Africa Tomorrow: Issues in Technology, Agriculture and U.S. Foreign Aid. It has found that low resource technologies are key to increasing food production in the developing nations, and the study will determine which low resource technologies can increase food production and what the United States role should be and what the United States should be in their development and transfer and whether such technologies could be of use to domestic agriculture.

I would welcome any comments you might have or any suggestions you might have with regard to the direction in which that OTA study should be heading as we address these problems.

Mr. BROWN. There are a number of things that I think are going to have to emerge over time as sort of the basic guidelines in which we think about agricultural policy, not only in developing countries but here as well. One is that many of the agricultural practices used in the world today, probably those being employed on 35 percent of the cropland, are leading to an excessive loss of topsoil and, over time, this is going to take a heavy toll. In our State of the World, 1986 report that we are just now finishing and will be releasing early next year we point out that there are 17 countries that now have lower crop yields than they did a generation ago. And this is largely the result of agricultural practices that have led to soil erosion so severe that it has overridden any efforts to use modern technologies to increase land productivity. So that would be one sort of general guideline that I would keep in mind in pursuing the study.

The second would be in the energy intensity of agriculture. We know now how to get very high yields, but the techniques that we use are heavily energy intensive and over the long term, as we move into the next decade and the early part of the next century, it is going to become more difficult to use large amounts of energy, which will become increasingly costly, the short-term oil decline—price decline notwithstanding. And so we need to ask questions, very basic ones like how do we design not only agricultural systems but social systems where we can recycle nutrients in a comprehensive way? And one of the overriding demographic trends of the last half of this century has been of people moving into cities. And as more and more people concentrate, it becomes more difficult to recycle nutrients. But over the long term nutrient recycling is going to be one of the keys to sustainable agriculture.

Another area, a sort of general guideline for considering these issues I would suggest is that we begin to think about water efficiency in the same way that we now think about energy efficiency. I think with water we are now where we were with oil in, say, 1970. When everyone thinks about trying to balance supply and demand, it is almost exclusively in terms of doing things on the supply side to increase the supply. But I think we are now moving into a period where we have to consider very carefully not only the agricultural practices that are water efficient, but the crops themselves that are water efficient. And so I would suggest these three sort of resource-based guidelines relating to soil and energy and water that I think are going to be the key to shaping sustainable agriculture over the long term, and that will over time begin to define appropriate technology itself. Because technologies that will be appropriate in a water scarce, energy scarce, soil scarce world will be those that are efficient in the use of these three resources.

Mr. GILMAN. Thank you, Mr. Brown.

Thank you, Mr. Chairman.

Mr. SCHEUER. Mr. Brown, you have been generous with your time. We understand you are under some pressure. We will release you today with cordial thanks for the time and effort you extended in coming here.

I will ask unanimous consent that the record be left open so that any member can ask you questions in writing. We will keep it open for 10 days or 2 weeks, so that you will have a chance to respond.

Thank you very, very much for coming here today.

Mr. BROWN. Thank you, Mr. Chairman.

Mr. SCHEUER. We will now hear from a panel composed of Mark Edelman, Assistant Administrator for Africa for the Agency for International Development, accompanied by Steve Sinding, Director of the Office of Population, Bureau of Science and Technology of the Agency for International Development.

STATEMENTS OF MARK L. EDELMAN, ASSISTANT ADMINISTRATOR FOR AFRICA, AGENCY FOR INTERNATIONAL DEVELOPMENT; STEVEN W. SINDING, PH.D., DIRECTOR, OFFICE OF POPULATION, BUREAU OF SCIENCE AND TECHNOLOGY, AGENCY FOR INTERNATIONAL DEVELOPMENT

Mr. EDELMAN. Thank you, Mr. Chairman. Accompanying me, besides Mr. Sinding, also, I would like to point out, on my left is Ray Love, who is my senior deputy for the Africa Bureau, and also has wide experience as well in Asia as well as Africa, if you have any questions.

Mr. SCHEUER. We are delighted to have the three of you.

Why don't you proceed for 6, 7, or 8 minutes and sum up your testimony, hitting the high points, refer to anything that you have heard this morning while you have been sitting here. Then we will ask Mr. Sinding and Mr. Love, if you would like, to add any remarks. Then we will have some questions for the three of you.

Mr. EDELMAN. Thank you, Mr. Chairman.

Mr. Chairman, rather than restate what is in my testimony, I think I would like to branch out into some other, broader areas. I don't want to bother rehashing what are the problems of Africa. In response to questions I would be glad to do that, but I think the previous witness did that, and I think my testimony has some of that in it, certainly Dr. Brady, yesterday's testimony had a lot in that. And I would be glad to answer questions but not talk about the problems.

Instead, I would rather stress the long-term nature of solving these problems. There are no quick fixes. There are no easy solutions. And most importantly, I would like to point out from the standpoint of the donors, all of the Western donors, we have only been at the agricultural research problems in Africa for about 10 years. No longer than that. That compares to having been in the research effort in Asia since at least the early fifties, in Latin America longer than that. But no one really paid much attention to Africa to begin with, any of the development problems of Africa, but certainly not agricultural research in Africa for about the last 10 years. It takes a good 15 to 20 years to develop new seed varieties and to get them promulgated. So we are new at the game. And we have got a lot of—we have made a lot of mistakes. The donors have made mistakes. The Africans have made mistakes. And I think we will continue to make mistakes. I will not begin to say that all the money that we spend is going to produce results. Development, by its nature, is trial and error, and especially in Africa where the problems are much worse from almost any point of view than they are anyplace else.

Another point I would like to make, is that although it has been commented on, is to stress again that technology simply will not give results that are required and needed without the proper policy changes. And here I am not speaking of just the pricing incentives, the marketing incentives and the more macro kinds of issues that have been commented on before, and I would be glad to comment on again, but as one highly respected agricultural research director—African agricultural research director mentioned to me only yesterday, the environment in Africa isn't well-suited today for agricultural research. And that is a problem I think of the will of the Africans, which is paramount——

Mr. SCHEUER. Excuse me. When you say environment——

Mr. EDELMAN. Yes.

Mr. SCHEUER [continuing]. What kind of environment do you mean?

Mr. EDELMAN. Yes, I do not mean the natural environment here. I mean more of the setting for research.

Mr. SCHEUER. In the political, administrative, bureacratic——

Mr. EDELMAN. Exactly.

Mr. SCHEUER [continuing]. Public policymaking environment.

Mr. EDELMAN. Exactly, Mr. Chairman. Exactly that.

He made, for example, he said that there are really no incentives for researchers. There are no reward system for researchers in Africa. I am speaking here now of Africans, by the way. There are no reward systems for Africans there. There is no recognition by African governments of what they do. And many of the national research centers have been taken over by the governments. As opposed to being semiautonomous, they have become part of government bureaus and government bureaucracies. And what that means is the directors of those research centers have to spend their time running to government meetings on bureaucratic kinds of things. They have to accept employees not on the basis of merit, but because of political favoritism. A problem of bloated bureaucracy, which affects most African countries, and affects them. And it provides disincentives for them to do research. And he said as a result of these kinds of things several very noted African researchers have left the continent even. They have gone elsewhere. They have gone to Asia to do their research or they have gone to Latin America to do their research.

That the Africans themselves don't provide the incentive, which feeds into the point the best efforts of the West can't do the job for Africa. Fundamentally, Africans have to do it for themselves. We can't do it for them. We can help them do it.

Let me say also that as gloomy as things have looked, and some people preach gloom and doom about Africa, there is a lot of progress that has been made in the last few years—a terrific amount of progress that can be a source of optimism. We have, as my testimony says and as Dr. Brady said yesterday, there are a lot of new varieties of maize, cassava, cowpeas that offer very exciting technical breakthroughs and great promise to improve agricultural production. New efforts, new successes in insect control which affects both plants and animals are either on the horizon or have already produced initial results, and breakthroughs are coming.

On the issue specifically of desertification, I am very heartened by the statements of and the interest of President Diouf, the president of Senegal and now the chairman of the Organization of African Unity, who several months ago had a conference, I believe it was last year, in Senegal on this subject. He made it—he was here on Friday; in fact, I met with him earlier this week, but he was also here Friday and spoke before the Desertification Conference that Howard University had. He intends to call a conference next month as well on the subject of desertification in Africa. That is what is desperately needed: For Africans to become more aware of their problems and that they, themselves, must address—it is a consciousness-raising effort and that they must address the problems themselves and what they can do. We can only help.

But that is a very encouraging sign I think, a man of the stature of President Diouf to be doing that.

The OAU summit in its recent Addis declaration called on, had the agreements of the African countries that they will devote 20 to 25 percent of their own resources for agriculture. That is a sharp break with the past and also a very encouraging sign.

Our agriculture research plan answers some of the questions that Mrs. Schneider was talking about. Where are we going in a long range plan? And if I may, Mr. Chairman, not only would I like to present this for the committee's use, but I would encourage you, if you have the space, to even put it in the record for the reason that I would like the widest possible dissemination of this plan. We have sent it all around: We have shared it with the World Bank, we have shared it with other donors, we have shared it with other African countries; and welcome comments on this plan of how we intend over the next 20, 25 years to do—to tackle the problems of Africa.

Mr. SCHEUER. We can easily put that in the record, and we will do so.

Mr. EDELMAN. Thank you, Mr. Chairman. And it addresses specifically a lot of those kinds of questions.

[The AID Agricultural Research Plan follows:]

Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa

May 1985

Agency for International Development
Washington, D.C. 20523

May 15, 1985

Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa

The proposed plan builds on several previous papers including:

- Africa Bureau Strategic Plan
- A.I.D. Policy Paper: Food and Agricultural Development
- Africa Bureau Food Sector Assistance Strategy Paper
- A.I.D. Sector Strategy for Agriculture
- Africa Bureau Agricultural Research Strategy Paper
- A.I.D. Priorities for Research in Agriculture
- Africa Bureau Strategic Plan for Agricultural Education and University Building (draft)

Executive Summary

Improved technology is necessary to achieve agricultural progress in Africa. However, the research task in Africa is especially challenging because the physical conditions for agricultural production are very difficult, labor is a constraining factor at critical periods during the year, and research on food commodities by African institutions is very recent and generally weak. This document sets forth a two-pronged approach to this problem:

- Strengthening agricultural research capabilities
- Strengthening faculties of agriculture

Agricultural technologies are usually location-specific and sensitive to agro-ecological and socio-economic environments of the farmers who use them. Even to borrow effectively, it is necessary to identify, screen, and interpret possible alternatives; borrowing requires some capacity to do research. A period of 20 to 25 years may be the minimum feasible planning horizon to achieve desired results, even in those countries which are highly committed to developing strong national research capabilities. In order to make most effective use of the Agency's scarce resources, this plan aims to:

a) Strengthen national agricultural research systems in approximately 8 core countries

b) Build strong applied research capacities in neighboring countries to enable local scientists to screen and borrow technologies and adapt them to local environments

Research networks -- which link national agricultural research systems with international agricultural research centers (IARCs), collaborative research support programs (CRSPs), and other research programs -- will serve as a means of both accelerating research payoff as well as strengthening national systems. The networks link a "critical mass" of scientists to work on aspects of problems which transcend national borders. Support will be given to research networks on four to six priority commodity areas in consultation with interested countries and IARCs.

Shortages of staff trained at the college and post-graduate levels are a major problem of national research systems. Participant training can supplement and reinforce efforts to develop national capabilities. However, the only long-term solution to Africa's severe shortage of trained agricultural personnel is to expand the capacity and improve the quality of national higher educational institutions. Under this plan, long-term assistance will be provided initially to four to six faculties of agriculture. These should be in the same countries where we are strengthening agricultural research systems. Our assistance will be purposefully designed to build linkages between the faculties of agriculture and other research institutions and programs.

In order to mobilize the vast range and amount of resources necessary for this large and long-range effort, the U.S. is facilitating the coordination of support to agricultural research in Africa as part of its participation in the Cooperation for Development in Africa (CDA), an organization of seven major members of the Organization for Economic Cooperation and Development (OECD). We further intend to work closely with multilateral donors, especially the World Bank with respect to university development. AID will seek means within CDA as well as other mechanisms to cooperate with other donors to strengthen agricultural research capabilities and faculties of agriculture in Africa.

Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa

Introduction 1
I. The Problem 2
II. Why Agricultural Research and Why Faculties of Agriculture? 3
III. Present Program 5
  A. Agricultural Research 5
    1. Bilateral Projects 5
    2. Regional Projects 5
    3. IARCs 5
    4. CRSPs 6
    5. Centrally-Funded Projects 6
  B. Faculties of Agriculture 7
    1. Participant Training 7
    2. Bilateral Projects 7
    3. CRSPs 7
IV. Discussion 7
  A. Need for Clear Objectives 8
  B. Need for Focused Program Priorities 9
    1. Country Criteria (Technology Producing Countries) 9
    2. Country Criteria (Technology Adapting Countries) . 10
    3. Commodity and Problem Research Criteria 10
  C. Need for Commodity Research 11
  D. Need for U.S. to Concentrate on Food Crops Research 13
  E. Need for Integrating AID Inputs 14
  F. Need for Long-Term Commitment 15
  G. Need for Stronger Management and Administration Capabilities 16
  H. Need for Financing Recurrent Costs 16
  I. Need for Donor Cooperation 17
V. Program Plan 18
  A. Agricultural Research 18
    1. National Research Systems 18
      a. Technology Producing Countries 19
      b. Technology Adapting Countries 19
      c. Commodity and Problem Research Priorities 20
    2. Research Networks 21
  B. Faculties of Agriculture 22
  C. AID Funding Levels 23
  D. Implementation of This Plan 24
VI. The Bottom Line: Food Self-Reliance 25

Annexes: A. Research Funding, Major Crop Zones, and Supporting Data
  B. Production of Major Crops
  C. Population Growth and Projections
  D. Agricultural Research: AID Annual Funding Levels Per Commodity -- FY 1984
  E. External Funding for Agricultural Research to Africa, 1976 and 1980, by Major Donors

May 15, 1985

Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa

Improved technology is necessary to accelerate agricultural and rural progress in Africa. The exceedingly high return from investment in agricultural research to develop new technologies -- the payoff from research -- is well-documented. Examples of high payoffs to research in Africa include cotton, oil palms in West Africa, and hybrid maize in Zimbabwe and Kenya.

This paper lays out a plan to strengthen the contribution of agricultural science and technology to achieve food self-reliance in Africa.*/ Emphasis will be given to strengthening:

- **Agricultural research capabilities**
- Faculties of agriculture

In order to make most effective use of Agency financial and human resources, criteria are needed to guide choices among countries and commodities to support. Twenty to 25 years of continuous support are required to build the research and human capital base to achieve desired results. Our effort will, therefore, draw on the resources of the entire Agency -- Missions, the Africa Bureau, and AID/W central bureaus -- working with African countries and other donors in a sustained, cooperative, focused program. National agricultural research systems will be strengthened in approximately 8 core countries. Strong adaptive research capacities will be built in neighboring countries to enable local scientists to screen and borrow technologies and adapt them to local environments. Networks will link national systems, international agricultural research centers (IARCs), regional research programs, collaborative research support programs (CRSPs), centrally-funded projects, and other-donor assistance on selected, high-priority topics. Four to six faculties of agriculture will be selected initially for long-term assistance.

Policy, credit, input supply, marketing, extension, and other support services also are important to agricultural progress. This plan, however, specifically addresses agricultural research and faculties of agriculture, and is presented to show what is needed to obtain technical breakthroughs in African agriculture. To translate this into production breakthroughs will require concomitant investments in infrastructure, input supply systems, marketing, and substantial policy reform. The other complementary development activities will be reviewed separately, taking into consideration the approach in this plan for research and faculties of agriculture.

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*/ Self-reliance in food is defined as the ability of a country to assure continuing food security to its population from a combination of domestic production, storage, and importation of food at commercial terms paid from foreign exchange earnings.

I. The Problem

Agriculture provides income and employment for over two-thirds of the population of Africa. Nearly all countries are dependent upon agriculture for the major part of foreign exchange earnings. Increased agricultural productivity is essential for raising government revenues and is necessary for improvements in nutrition, health, and the general quality of life.

The performance of African agriculture has been dismal; per capita food production has declined during the last two decades. Since 1960, growth in aggregate food production has averaged less than two per cent per annum. Yields per unit of land for food commodities are the lowest of any region in the world. The result has been growing dependence on food aid and increasing use of scarce foreign exchange for food imports rather than for other pressing development needs. A close examination of the African agricultural situation indicates that the causes of the poor performance include difficult physical and harsh climatic conditions; restrictive economic policies; weak institutions; critical shortage of scientists, teachers, and agricultural managers; and few farmer-tested high-yielding technologies.

Physical Environment and Climate While Africa has some highly fertile and productive areas, there are vast areas where growing conditions are unfavorable because of difficult physical and climatic conditions. The extension of agricultural production has often been accompanied by devegetation that has depleted soil fertility and reduced the water-holding capacity of the fragile African soils. The arid land of the Sahel and the soils of the coastal and central tropics of Africa present unusually difficult physical environments for agricultural production. Irrigation will be a long-term and then only partial answer to meeting Africa's food needs. The tropical soils of Africa present management problems that have not yet been properly addressed.

Government Policies Unfavorable economic policies have contributed to the present agricultural crisis in three key areas. First, trade and exchange policies have overprotected industry, held back agriculture, and absorbed too much administrative capacity. Second, many governments have created large state production and marketing and input supply organizations that are incapable of efficiently performing their assigned tasks. Finally, most African governments have not established an economic incentive structure for increasing agricultural production. Rather, price, tax, exchange rate, and investment policies reflect a consistent bias against agriculture.

Institutions The basic institutions required to step up agricultural production are weak in financial and manpower resources in most countries of sub-Saharan Africa. The colonial powers in Africa underinvested in human capital, food crop research, and internal transportation networks to strengthen internal market linkages for inputs or commodities. In the twenty-five years of independence, little progress has been made by African governments in correcting these past mistakes, in part due to lack of political commitment and lack of resources. Today most countries do not have adequate infrastructure to support a major expansion in agricultural development. Donors have also been short-sighted by focusing on discrete projects and by pursuing an on-again, off-again approach to supporting basic agricultural institutions.

Indigenous Scientific Capacity There is consistent evidence across the continent that there is not enough qualified human capital to carry out a sustainable agricultural development effort. Since independence, African governments have made little progress to improve the situation. Opportunities for professional growth are limited. Lack and underutilization of trained human capital, ranging from farmers to senior administrators and scientists, coupled with poor management of existing resources, are major factors in the present agricultural crisis.

Technologies Lack of productive research institutions in most African countries has resulted in a dearth of farmer-acceptable improved technologies needed to increase agricultural production and productivity. The expatriate-led export research capacity developed under colonial rule has deteriorated. With the single exception of maize, "African agriculture has probably been less affected by technology change in the past twenty years than agriculture on any other continent." (USDA: 1981)

II. Why Agricultural Research and Why Faculties of Agriculture?

The process of modernization or development is inevitably a process of de-agriculturalization. While the absolute size (in total GNP) of the agricultural production sector increases, other sectors (including agricultural support and processing industries) grow even faster so that the relative share of agriculture in GNP decreases. Thus, the U.S., which is the outstanding example of this process, moved from an economy in which practically the entire population was engaged in direct agricultural production to one in which less than two percent of the population is now engaged in that occupation -- while in the process, becoming the major agricultural exporter in the world. This transition was not achieved by neglecting agriculture; on the contrary, agriculture received substantial public support which enabled it to "finance" the development transition.

Research, initially largely supported by public funds, was a powerful contributor to the development transition in the U.S. Although the beginning of a formal public-supported agricultural research process dated to 1861, results in terms of increased yields did not begin to appear until the 1930s with the introduction of improved soil husbandry and the spread of hybrid corn. From then on, productivity increases have been the principal contributor to U.S. agricultural growth. As time has passed, privately-financed research has become an increasingly active contributor, complementing and, in some cases, replacing public research programs.

Much has been written about the failure of the Green Revolution to emerge in Africa. But recent studies have shown that agricultural technologies are usually location-specific and sensitive to agro-ecological and socio-economic environments of the farmers who use them. Africa's disappointing experience with technology generation and transfer since independence adds further evidence to the historical record that "only a country that establishes its own research capacity in agriculture can gain access to the advances in knowledge that are available to it from the global scientific community and embody that knowledge in the technology suited to its own resource and cultural endowments." (Ruttan; 1984) When one asks "why put more money into agricultural research in Africa?", the clear answer is that strong support for agricultural research is necessary to promote African development.

National agricultural research institutions and programs in Africa vary in both size and effectiveness; in general, however, they are weak and poorly staffed, equipped, financed, and managed. Most national agricultural research programs in Africa are structured along disciplinary lines. Until recently, research was oriented toward export crops and animal health, with food crops and animal husbandry largely neglected. The research programs concentrated on the physio-biological aspects of crop and livestock production with limited attention to socio-economic aspects of African farming. Most of the research has been -- and, to a large degree, continues to be -- done in laboratories and on experiment stations with few direct linkages with, or participation by, extension service personnel or farmers. Linkages among national systems, international agricultural research centers, and other external sources of technology are limited. These orientations are beginning to change, but much more needs to be done.

Shortages of staff trained at the college and post-graduate levels are a major problem for national agricultural research systems. Participant training may be a short-term answer and has an important longer-term role if used to supplement and reinforce efforts to develop local capabilities. Higher education capacity is increasing (about 10 per cent per year) but is still inadequate. The only long-term solution to Africa's severe shortage of trained agricultural personnel is to expand the capacity and improve the quality of higher agricultural educational institutions.

Universities in Africa have much in common. They generally are small institutions which concentrate on teaching. Entering students are poorly grounded in science and require extensive remediation which takes attention away from the regular curriculum. With few exceptions, little research is carried out at universities and the quality of research is low. Resources are scarce and there is little opportunity for collegial interaction or peer review. As yet, research activities in universities and government ministries are not closely linked. As a result, a scarce and valuable resource, the better trained scientists who often locate at the universities, is underutilized.

Efforts to achieve economies of scale through regional universities have consistently failed. Each nation wants its own major institution, which is understandable in terms of national prestige considerations. But, in some cases, the broader objective of African agricultural development has been ill-served by this approach.

Support to agricultural research and to faculties of agriculture in selected countries will respond to the major problem areas inhibiting African agricultural development. Research will produce farmer-tested high yielding technologies adapted to the difficult physical and harsh climatic conditions. Sustained support to research systems and faculties of agriculture will promote stable productive institutions and improve the supply of trained scientists, teachers, and agricultural managers. Improved agricultural research systems and stronger faculties of agriculture, while not sufficient by themselves, are necessary for African agricultural progress.

III. Present Program

Agriculture is the central focus of AID's long-term development assistance strategy for Africa. Agricultural projects, in general, accounted for 47 percent of African Bureau obligations in FY 1984. Support to agricultural research and faculties of agriculture is a large part of this assistance.

A. Agricultural Research

AID uses a number of tools to support agricultural research in Africa including bilateral projects, regional projects, international agricultural research centers (IARCs), collaborative research support programs (CRSPs), and centrally-funded projects. The Agency currently funds almost $100 million of agricultural research in and on Africa annually.

1. Bilateral Projects

To improve agricultural research in Africa, AID works to strengthen national agricultural research capacities to generate and utilize technology. Included in a "national system" are all public and private institutions involved in conducting research to develop agricultural technologies. For FY 84, fifty five mission-funded projects located in 25 countries had agricultural research components. Annual expenditures for the research components are estimated at $51 million.

2. Regional Projects

AID supports regional projects promoting the sharing of research, the exchange of other types of information, and the cooperation of donors. For FY 84, eight regionally-funded agricultural projects had research components. Three of these are located in the Sahel, two are in the Southern zone, and three cover the whole continent. Annual expenditures for the research components are estimated at $22.4 million.

3. IARCs

International agricultural research centers (IARCs) -- the institutions supported by the Consultative Group for International Agricultural Research (CGIAR) plus associated centers funded by international donors outside the CGIAR -- provide a research system that works on most of the major food crops and animals, food policies, and improvement of national research systems. Four CGIAR-sponsored activities are located in Africa: the International Institute of Tropical Agriculture (IITA), the International Livestock Center for Africa (ILCA), the International Laboratory for Research on Animal Diseases (ILRAD), and the West African Rice Development Association (WARDA). A substation of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and associated centers, i.e., the International Center for Insect Physiology and Ecology (ICIPE) and the International Center for Research on AgroForestry (ICRAF), are also located in Africa. Other IARCs carry out research which applies to African problems and are linked to African national research systems. For FY 84, AID provided $45.3 million (approximately 25 percent of the total) for core support to the CGIAR-sponsored IARCs. Of this amount, approximately $14.4 million is estimated to be directly or indirectly supportive of African agriculture. In addition, AID provides $4 million annually to the International Fertilizer Development Center (IFDC), of which approximately $500,000 is directly or indirectly in support of agriculture in Africa.

4. CRSPs

Collaborative Research Support Programs (CRSPs) provide a means by which the talents of research scientists from the U.S. and developing countries can be mobilized to focus their collective efforts on solving long-term agricultural research problems of common interest. In FY 84, approximately $5.3 million of CRSP expenditures were directly or indirectly in support of agriculture in Africa -- sorghum and millet ($1.6 million), beans and cowpeas ($1.6), small ruminants ($0.8), tropical soils ($0.7), peanuts ($0.5), and aquaculture ($0.1).

5. Centrally-Funded Projects

By means of contracts and cooperative agreements, AID maintains and strengthens the technical competence of U.S. universities and other institutions in specialized areas so that the institutions, in turn, may better serve AID regional bureaus and missions by providing an array of expertise needed for high-priority tasks. For FY 84, 20 centrally-funded (S&T/AGR) projects provided direct or indirect support to agricultural research in Africa. Annual support was approximately $2 million in eight areas: crop production ($0.3 million), livestock production and health ($0.3 million), pest management ($0.1 million), post-harvest loss ($0.4 million), soil and water management ($0.3 million), bio-technology ($0.1 million), fisheries and aquaculture ($0.2 million), and economic policy and planning ($0.4 million).

B. Faculties of Agriculture

AID supports faculties of agriculture through participant training, bilateral projects, and CRSPs. The Agency funds approximately $20 million in support of faculties of agriculture in Africa annually.

1. Participant Training

AID currently provides approximately $6.8 million for long-term training for 250 additional Africans each year pursuing B.S., M.Sc., and Ph.D. degrees in the various disciplines of agricultural sciences. This represents an increase in numbers of trainees of almost 40 percent since 1979.

2. Bilateral Projects

For FY 1984, AID obligated $12.7 million for strengthening institutions involved in higher education in agriculture. Three institutions offering degrees in agriculture at the B.S. level and higher received $9.2 million (Cameroon, Uganda, and Zimbabwe). In addition, three post-secondary institutions offering technical training (including certificate and diploma levels) received $3.5 million (Kenya, Lesotho, and Liberia).

3. CRSPs

Several CRSPs are active in universities in several African countries. The degree training in the CRSP contributes to improved research capabilities and leadership at the national program levels.

IV. Discussion

For the past 15 years or more, AID and other donors have attempted to reverse the declining per capita food production in sub-Sahara Africa. The Agency has been investing in agricultural research capacity development by providing technical assistance, training, and other physical support to national research institutions. This support has been given to some 25 African nations addressing scores of different commodity and factor-specific research problems. However, these investments have been erratic and the results have been disappointing because they have not built adequate African agricultural research capacity nor have they generated the farmer-relevant technology needed.

The Africa and S&T Bureaus are rethinking approaches to technology and manpower development in Africa to improve the effectiveness of investments in agricultural research and faculties of agriculture. Our past experience in

Africa provides strong guidance for shaping future investments. The following broad points are crucial:

1. We need explicit objectives for agricultural research.
2. We need focused program priorities to emphasize selected countries, commodities, and problems.
3. We need to give greater support to commodity research.
4. We need to concentrate on food crop research, recognizing that food crop production can contribute significantly to income and export growth.
5. We need to improve the complementarity among AID's various mechanisms for undertaking investments in agricultural research and faculties of agriculture.
6. We need to make a long-term commitment toward the development of agricultural research and higher education.
7. We need to assist countries to develop their management and administration capabilities in research.
8. We need to be willing to finance a portion of recurrent costs of research programs and faculties of agriculture, where appropriate.
9. We need to cooperate with other donors in planning and carrying out these investments.

A. Need for Clear Objectives

AID's overall objective is to assist African countries to develop improved technologies for farmers which can increase agricultural production and incomes. Africa's nations differ substantially with regard to population, size, economic stability, commitment to agricultural development, institutional capacity, and a number of other factors that influence a nation's ability to benefit from donor assistance. Moreover, some countries are simply too small or too resource-poor to provide the base needed to develop and sustain full-fledged agricultural research systems. In recognition of this, AID intends to pursue a dual strategy. In those countries having the natural and economic base to develop basic and adaptive research, the Agency will make investments to build this capacity so that the technology generated can be used at home and transferred through networks to neighboring countries. In a second group of countries that lacks the economic resource base to develop and finance a large national agricultural research service, investments will be made to strengthen the manpower capacity of the research service to borrow technologies generated in other countries and research centers and to adapt the technologies to local needs and conditions. This basic division will be discussed below.

B. Need for Focused Program Priorities

To assure that AID's investments are in areas of high potential and payoff, a set of criteria has been developed to make sound decisions in allocating limited research resources.

1. Country Criteria (Technology Producing Countries)

At present, AID provides resources to strengthen national research institutions in about 25 countries. Project investments have supported a wide range of commodities, as well as provided a number of expatriate scientists. This broad-gauged support was considered necessary because of the weak scientific manpower base in most small countries, but the effect has been to fragment and reduce the impact of our agricultural development resources. So far, the payoff in terms of relevant technology has been disappointing.

Therefore focus will be given to a limited number of key countries with a high payoff potential for generating new technology. The technology producing countries would each meet the following criteria:

(1) Cultivated area of at least 100,000 hectares in each commodity for which research assistance is planned.

(2) A research staff of 100 or more scientists (it takes a minimum of 8 to 12 scientists to make progress on one commodity).

(3) Three or more functioning research stations located in the important agricultural areas of the country.

(4) A national research system pursuing prioritized commodity and problem solving research.

(5) A national research system having working relationships with IARCs, CRSPs, neighboring national programs, and regional programs.

(6) A national agricultural research budget that demonstrates a history of steady support and reasonable per-scientist funding.

(7) A faculty of agriculture with capacity to teach and do research, providing B.S.-level graduates qualified to pursue graduate study at universities in Africa or under the aegis of U.S. participant training programs and producing (or with potential to produce) M.Sc. graduates who have capacity to do research.

In countries that satisfy these criteria, AID will provide support for both technology generation and adaption/utilization. It will support faculties of agriculture in those countries where opportunities for training M.Sc.-level graduates exist.

2. Country Criteria (Technology Adapting Countries)

Countries with small national research programs will be provided assistance to strengthen their capacities to screen, borrow, and adapt technology from technology producing countries, regional networks, IARCs, and CRSPs. The Agency will make investments in technology adapting countries which meet the following criteria:

(1) Cultivated area for priority crops of about 100,000 hectares.

(2) An agricultural research staff of 20 to 80 scientists, which could be organized into commodity teams of eight to twelve professionals capable of adapting technology from the IARCs, CRSPs, and regional networks.

(3) Two or more operating research stations.

(4) A national research system willing to establish research priorities.

(5) A national research system interested in and willing to establish regularized working relationships with IARCs and other research institutions outside the country.

(6) National leadership that indicates a willingness to consider funding recurrent and operational costs of national research institutions and to provide reasonable per-scientist research support.

(7) A faculty of agriculture with some capacity to provide B.S.-level graduates to serve on research commodity teams and to qualify as participants for graduate training.

In countries meeting these criteria, AID will provide support for technology adaptation/utilization. If a specific national commodity research team requires a particular discipline (soil fertility or agronomy) to strengthen its capacity to borrow technology from a regional network, consideration would be given to providing the needed professional assistance. Participant training will be used to build the numbers and quality of trained researchers. Countries failing to meet these minimum criteria will receive limited assistance for agricultural research, primarily participant training.

3. Commodity and Problem Research Criteria

Any research allocation system, regardless of how intuitive or how formal, cannot avoid making judgments about two major questions. The first question is: what are the possibilities of producing scientific and technical advances if resources are allocated to research on a particular commodity, a particular resource problem, or a particular disciplinary or scientific field? The second question is: what will be the value to society of the new knowledge or the new technology if the research effort is successful? To help ensure that the Agency's research investments will have a technological and production impact, investments will be focused on a handful of key staple foods and related problems which are central to Africa's food needs. The criteria by which commodities and research problems will be selected include:

(1) The extent to which the commodity contributes to present and projected (taking into account future demand) calorie intake in rural and urban populations.

(2) The likelihood that improved farmer-relevant technology can be developed to increase production, given the expertise and state-of-the-art in the U.S. and the IARCs.

(3) The availability within the national research system of a minimum cadre of four M.Sc. or Ph.D. scientists backstopped by a staff of eight B.S. level specialists to work on priority research problems.

(4) The comparative advantage of the U.S. in making available knowledgeable scientists and relevant technology that can be incorporated into ongoing national research programs.

In general, AID intends to increase support to commodity research. However, the objective of this commodity research should be to develop higher yielding varieties based on management and input intensities appropriate to African circumstances. Besides increasing genetic potential, due attention must be given to economic and cultural problems such as labor availability and to disease and pest resistance, germination/maturation, soil and water management, and other matters that are particularly significant in the African setting.

There is general agreement that livestock production plays an important role in African agriculture. Livestock raising is carried out under mixed farming (crop/livestock) and range-type conditions. Interventions have characteristically been focused on range management, disease control, and improved nutrition. Lessons learned in the last 10 to 15 years of experience demonstrate that western range management approaches have been found ill-suited to the African context. Consequently, initiatives in livestock research should be promoted slowly and should focus on animal health and nutrition in mixed farming systems where animal traction and income generation through improved production are the central thrusts. In the absence of major animal diseases, nutritional stress is the major constraint to efficient livestock production. The solution to this problem lies in either increased fodder from food crops or improved grasses and forages.

C. Need for Commodity Research

The magnitude of food production increases required to meet Africa's overall population growth of about 3.5 percent annually suggests that some combination of a large number of marginal production improvements and a few major breakthroughs in staple foods are urgently needed.

The very promising new sorghum varieties in the Sudan and the prospects for biological control of mealy bugs and green spider mites (major cassava pests) are examples of extended, continuous research cooperation that are bearing their fruits now. A major technical breakthrough can only come about by improving the genetic characteristics of crops and knowledge of soil and water management relationships. Dramatic improvement in genetic materials and soil and water relationships requires a time frame of ten to fifteen years. In the short term, the outlook for many major technical breakthroughs is limited because of the long lead-time required to develop a sound research program. Hence, it appears that during the next five to ten years, food production increases must result primarily from marginal production improvements. These marginal improvements will most likely be achieved through improved agronomic practices and pest control.

Consequently, commodity research plans need to be focused on dual objectives: (a) a modest continued investment in the short-term to take advantage of whatever marginal production improvements can be generated and (b) major investment on genetic improvement and soil and water relationships for the long-term. A continued emphasis on marginal production improvements will help build the scientific knowledge base and provide opportunities for newly-trained scientists to gain practical experience, thus providing a base for the long-term emphasis on commodity work which will eventually lead to major technical breakthroughs. Major production breakthroughs are needed, eventually, to gain the required confidence of African governments and convince them that increased investments in agricultural research are justified over the long-term.

Farming systems research is not an end in itself, but rather a means of improving the overall technology generation and diffusion process contributing to production improvements. A knowledge gap exists between on-station commodity research work, the technology-transfer mechanisms, and the farmers as end-users of technology. Information on farming systems is needed in each commodity area to better understand the production system, the diversity and interrelationship of crops grown, the farmer's decision-making process, and potential areas where technological changes are most needed in the farming system. Farming systems research, by which we mean on-farm research with a farming systems perspective, offers a cost-effective means to fill this knowledge gap.

On-farm research should be aimed specifically at strengthening the on-station research being conducted by national institutions. Cost effectiveness is achieved by emphasizing a few priority enterprises, by bringing biological and socio-economic concepts together early in the research process, by implementing much of the research on farm, and by linking experimental station work and technology transfer activities to the research. Balance between commodity and farming systems research must be sought in any national research program.

There is general agreement that agro-forestry will play a role in agricultural development in most African nations. Agro-forestry has already been an accepted practice by farmers in many countries;

interventions include alley cropping, shelterbelts, random tree plantings, and tree border plots. AID assistance to agro-forestry research should support and complement research on the priority commodities using tree planting technology already developed at the IARCs for soil and water conservation. The priority commodity and agro-forestry work should be carried out at the farm level through national on-farm testing activities.

D. Need for the U.S. to Concentrate on Food Crops Research

Growth prospects for African agriculture depend ultimately on response to commercial opportunities. Nearly all farmers in Africa are engaged in some form of commercial agriculture. Farm families participate in commercial transactions through sale of food commodities, export crops, livestock, labor, and in other ways as well. Exports generate foreign exchange to import production inputs -- fertilizers, pesticides, and petrochemical fuels -- for food crop production. Sales of crops generate income to purchase food. Thus, there is a need to understand, at the national level and at the household level, how farm families participate in commercial transactions and how this influences food crop production.

The U.S. has a comparative advantage in food crop research. We have a base of knowledge about most of the major food crops grown in Africa and we also have the capacity for training scientists to research food commodities. Other donors, particularly the European countries and the IBRD, we believe, have a comparative advantage in providing technical assistance for research on many traditional African export crops (e.g., coffee, tea, and oil palm). Therefore, it seems appropriate over the next twenty to twenty five years for AID to focus on food crop research with the expectation that the private sector and other donors will also support food crop research as well as traditional export crop research. Such assistance should be coordinated to strengthen national research systems.

In suggesting this division of responsibility, several observations should be borne in mind. First, food crops can contribute significantly to cash sales, including exports. For example, many small farmers market part of their food crop production, and several of the surplus-producing southern Africa countries export maize to neighboring countries. Second, there are several ways, in addition to research, that AID can encourage commercial agriculture. For example, policy changes through exchange rate adjustments and improving efficiency of marketing parastatals can be powerful export stimulants. Third, private sector activity can be promoted. Firestone, Uniroyal, Del Monte, and United Brands, to name but a few, have research knowledge and capabilities of value for Africa in food and cash crops. Satellite farming -- agribusiness organizing small farmers to produce high-value cash crops by providing inputs, credit, technical advice, and, most importantly, a market -- shows considerable potential.

E. Need for Integrating AID Inputs

AID relies on bilateral projects, international agricultural research centers (IARCs), collaborative research support programs (CRSPs), and regionally and centrally-funded projects to provide its support. Each mechanism has strengths and weaknesses, and the relative advantages and disadvantages of these mechanisms are continually evolving.

The bulk of Africa Bureau funding for research is provided through bilateral projects, mostly implemented by Title XII institutions. Bilateral projects enable AID to respond directly to host country needs and give the on-the-ground presence required for sound institution-building. During the past decade, U.S. universities have made progress in developing cadres of scientists knowledgeable about agriculture and working conditions in Africa and about AID operations. They have a comparative advantage in (1) education and training of research personnel and (2) institution building. They provide the major means of training Ph.D. level researchers for Africa at present. However, the effectiveness of this mechanism is reduced by (a) the generally short duration of projects; (b) frequent contractor staff turnover; (c) difficulty in obtaining fully-qualified staff including deficiencies in French language capability; and (d) tendency for project formats to distort and/or fragment host country research programs.

IARCs provide access to worldwide stores of germplasm, to a small but very significant group of international agricultural scientists whose collective LDC experience is invaluable, and to specialized non-degree training. They have a comparative advantage in (1) technical backstopping with long-term field staff, (2) on-the-ground network coordination, and (3) linkages with other international centers. But the IARCs tend to give attention to elite as opposed to local breeding materials and focus on input and management-intensive yield improvement rather than on labor-conserving technologies and other desirable plant qualities.

CRSPs focus on research with a long-term payoff and provide access to high-level expertise and training. However, integration into national programs and coordination with bilateral projects and IARCs could be improved.

Regionally and centrally-funded projects provide access to specialized technical skills and help develop U.S. institutional capacity. However, it is sometimes difficult to coordinate the use of these resources when financed by different AID/W offices, and, as a result, confusion can exist among host country counterparts and contractors regarding roles, responsibilities, and program directions.

All these mechanisms provide resources that are important to African agricultural research and development. The effectiveness with which these resources are deployed should be improved by refining and adjusting their roles in an evolutionary way based upon the lessons of experience. AID intends to:

-- Improve coordination in the delivery of assistance -- by giving increased support to the development of coherent, balanced, long-term national research plans into which diverse inputs can be fitted and by ensuring clear program direction for regionally-funded and centrally funded projects;

-- Improve the quality of Title XII participation by giving sustained and stable support to four to six U.S. institutions that are best placed to support our commodity and country priorities, thus enabling the institutions to develop their technical staff, managerial capacity, and base of knowledge of African agriculture needed to effectively implement bilateral projects;

-- Expand the capacity of the IARCs to support national program development by establishing and funding special projects -- especially where these projects incorporate a regional networking component; and

-- Improve the integration of CRSPs into the national and university research programs in Africa.

F. Need for Long-Term Commitment

There is now substantial empirical evidence that agricultural development in Africa is a slow, evolutionary, stepwise process. Similarly, agricultural research is a long-term process that should be conceptualized in time spans of decades rather than years because:

- Even if major efforts are initated now, it will take a minimum of 20 to 25 years, depending on the country, to train and upgrade an adequate level of human capital for the major agricultural institutions.

- It takes an average of 10 years between the initiation of expenditures on agricultural research and the availability of new technology and another 5 to 10 years to gain widespread adoption.

- It will probably take a period of 5 to 10 years in most countries to build the political support for a fundamental redirection in development strategies to give increased financial support to agriculture.

A long-term commitment must also be made to U.S. institutions to enable them to participate more effectively in an effort to strengthen agricultural research and faculties of agriculture in Africa. This would enable the U.S. institutions to hire additional permanent faculty for the particular purpose of interacting professionally with selected African institutions in such a way that the interaction is compatible with, in fact is supportive of, the U.S. academic incentive system.

Long-term commitments to research, training, and donor relationships are mutually reinforcing. AID should begin planning now for a sustained commitment of a minimum of 20 to 25 years to African agricultural research systems and faculties of agriculture in key countries where the potential for technological payoff is high. Once a long-term commitment is made to a country, AID should not act precipitously to terminate that support for short-term political or other reasons.

G. Need for Stronger Management and Administration Capabilities

In most African countries there must be significant improvement in the management and administration of agricultural research programs so that national systems can handle increased levels of support and so they can improve the effectiveness with which funds and staffs are utilized. Evaluations of our current generation of agricultural research activities indicate that poor management and administration are frequently constraining the available technical talent. Although specific country and organizational needs will vary considerably, strategies to improve management and administration will need to be built upon some combination of the following interventions: upgrading the managerial capacity of key individuals; improving the financial planning and budgeting process to align financial resources with research objectives; setting in place cost-effective systems to evaluate effectiveness of research expenditures; improving personnel management systems, performance incentives, and career paths to retain and make the best use of scarce staff; and making managers and scientists accountable for results or lack thereof.

In addition, explicit attention must be given to establishing reliable relationships between research organizations and other organizations upon which they depend (e.g., Finance Ministries, Planning Ministries, and Civil Service Commissions) as well as to establishing sound avenues for the exchange of information with groups they are expected to serve (extension workers and farmers). This is a broad but indispensable agenda that must be pursued in AID projects to build a technology development or adaptation capacity in African nations.

H. Need for Financing Recurrent Costs

Renewed attention to management and administration will go some way towards addressing the troublesome issue of recurrent funding by making better use of existing resources. But in the future agricultural research activities should explicitly tackle the recurrent cost issue by (a) ensuring that host countries are placing adequate priority on funding for agricultural research organizations; (b) taking advantage of opportunities to generate revenues (e.g., through user-fees or contributions in labor or in-kind); and (c) exploring opportunities to contract out ancillary support activities (e.g., maintenance of facilities) that might be done more efficiently by the private sector.

However, missions should be prepared to finance the recurrent budget of essential agricultural research activities provided that there is (a) an acceptable set of country policies (or movement toward these) so that the effectiveness of recurrent support is not in doubt; (b) an assurance that recurrent cost support has higher development impact than new investments; and (c) a clear inability of the host country to undertake recurrent cost financing. Even so, recurrent cost financing must be provided in the context of a carefully phased plan to shift the entire burden to the host country over a period of time not to exceed ten years. AID's Policy Paper on Recurrent Costs provides guidance on this complex area.

I. Need for Donor Cooperation

With many donors working in Africa, duplication of effort is a serious problem. If donors meet prior to project planning, conflicts of interest and duplication of effort can be minimized. Also, donors can work together and share costs in order to allocate sufficient donor resources to large-scale problems. For example, a logical division of resources would be for the U.S. to use its grant funds for technical assistance and training to complement financing from other donors for buildings, other infrastructure, and equipment. Similarly, the U.S. might direct support to research on food crops to complement research assistance on traditional export crops by European donors or the private sector. Special initiatives should be undertaken by AID missions to work with and strengthen collaborative efforts among countries. The responsibility to nurture regional collaboration is of primary importance to ensure that the contributions of IARCs, CRSPs, and centrally- and regionally-funded activities are fully utilized in achieving Agency agricultural development objectives. Donor coordination can help prevent the fragmentation of national programs that results when diverse projects are put in place without considering redundance and complementarities.

Cooperation for Development in Africa (CDA) -- an informal association of the seven major bilateral donors to Africa who provide 65 per cent of direct development assistance -- represents one organized effort of donors to cooperate. Within CDA, AID, the largest donor to agricultural research systems, serves as overall coordinator of assistance in agricultural research. AID and the World Bank have agreed to cooperate in exploring development of faculties of agriculture in Africa. AID is supporting World Bank initiatives to promote IARC-led commodity networks in Africa. AID also works through World Bank Consultative Group meetings, UNDP Round Table meetings, and other opportunities.

AID believes that, in the last analysis, donor cooperation will only be successful when host country governments take the lead in establishing coherent programs into which donor resources may be placed. Hence, AID will work with African colleagues and counterparts to establish strong national research strategies or plans and seek to use them as the framework for coordinating donor assistance to research and faculties of agriculture.

V. Program Plan

AID support in Africa for agricultural research and faculties of agriculture should adhere to five guiding principles, which are key to effective agricultural technology development in Africa.

1. Explicit Program Objectives and Priorities We will focus the bulk of our resources on a relatively limited set of countries, commodities, and research problems (particularly on soil and water relationships to the key commodities) where sustained assistance is most likely to achieve high payoff in producing new technology and income streams for producers.

2. Balanced and Integrated Commodity and Socio-Economic Research We will give increased attention to the development of strong commodity research programs, while refining the role of farming systems research to ensure that on-station research programs respond to the real concerns of African farmers. This includes renewed attention to the problems and potentials of commercialization of agriculture and to labor availability and utilization.

3. Sustained and Stable Support for U.S. and International Institutions We will increase the capacity of several lead Title XII institutions to support Agency country, commodity, and problem priorities. We will also encourage and assist IARCs to establish a stronger presence in the development of African national research systems as well as regional commodity networks.

4. Long-Term Commitment We will adopt a period of 20 to 25 years as the minimal acceptable planning period for assistance to African agricultural research systems and faculties of agriculture as well as our support for the U.S. and international institutions upon whose expertise we depend.

5. Donor Cooperation We will continue to facilitate donor cooperation in African agricultural research and faculties of agriculture. Our efforts will have two emphases: effective collaboration among donors and development of long-term national agricultural research strategies or programs into which diverse donor resources can be effectively placed.

A. Agricultural Research

Strengthening agricultural research capabilities will be based on a two-pronged approach to national agricultural research systems and zonal research networks.

1. National Research Systems

The dual task of capacity building and technology development will be addressed in two distinct ways depending upon the potential for payoff.

a. Technology Producing Countries

A few countries already have relatively strong bases in the areas of manpower, financial resources, area planted in priority food crops, and other-donor support. The following countries are top priority where agricultural research can be expected to have the largest potential and earliest payoff for development: Cameroon, Kenya, Malawi, Senegal, Sudan, Zaire, Zambia, and Zimbabwe. While still meeting the criteria for technology producing potential, the following countries should receive lower priority due to relative economic, social, and political considerations: Tanzania, Uganda, Ghana, Ivory Coast, and Nigeria. In order to benefit from active networking, at least one technology producing country should be located in each CDA-designated ecological zone. The proposed match is as follows: Sahel - Senegal; Coastal West Africa - Cameroon; Sudan - Sudan; East Africa - Kenya and Malawi; Zaire Basin - Zaire; and Southern Africa - Zambia and Zimbabwe. Missions in these eight countries are encouraged to assist the countries in developing strong national food crop research programs.

Within these programs, the short-term objectives will be to train scientists, build institutional capacities, and operationalize zonal networks to produce improved technologies. Agency investments will focus on two to four food crops that are predominant in the zone in which the country is located and which meet priority commodity criteria.

The long-term objective will be to produce improved technologies on a sustained basis. This will require several components. Each national system should develop sound management plans and long-term research agendas. Collaborative zonal networks will help to make research more cost-effective, reduce country-by-country duplication of effort, and improve testing and dissemination among scientists of research information. M.Sc. and Ph.D. participant training programs should take into account the scientific manpower needs of the selected country as well as the broader manpower requirements of the zone. In those countries where opportunities exist, AID will support development of faculties of agriculture to train M.Sc. scientists in specific disciplines needed to meet the commodity research objectives of the country and, to the extent possible, zone.

b. Technology Adapting Countries

The technology adapting countries generally need assistance to strengthen their capacities to import technology and adapt it to local micro-environments. The technology adapting countries tend to group into two categories. The countries with natural and human resources approaching minimal research requirements include Burundi, Madagascar, Mali, Togo, Sierra Leone, Liberia, Niger, Rwanda, Burkina Faso, The Gambia, Botswana, Lesotho, and Swaziland. In a second category of relatively less promising countries are Chad, Benin, Somalia, Mauritania, Guinea, Guinea Bissau, Central African Republic, Cape Verde, and Djibouti. Within each category, the countries are not listed in any order of priority. There is a presumption in favor of program and project assistance to the first group of technology adapting countries where it is feasible to consider long-term commitments to agricultural institutions. For the time being, our assistance to the second group of technology adapting countries will concentrate primarily on participant training.

Within these programs, the short-term objective will be to concentrate on building multi-disciplinary teams of 8 to 12 scientists who will develop commodity research programs in one or two staple foods. The commodities to be researched will be the predominant food crops in the particular ecological zones, e.g., sorghum, millet, and edible legumes in arid and semi-arid regions, maize in the eastern and southern zones, upland rice in the western coastal zones, and roots and tubers in the humid zones. Participant training initially will be focused on increasing the numbers of M.Sc. level scientists. Training graduate-level scientists at neighboring faculties of agriculture will be encouraged at the M.Sc. level, but Ph.D. training will be supported in the U.S. for the next 10 to 15 years. Little, if any, investments will be made to develop faculties of agriculture in the technology adapting countries.

The long-term objective will be to build minimum-size national research institutions capable of planning and managing at least two to three commodity programs. Attention will be given to cost-effective management to promote technology transfer through the research networks. A research institution in an adaptive research country may have special capacities to conduct research in particular areas, e.g., biological nitrogen fixation, as well as to screen plant materials for disease or pest resistance in collaboration with IARCs, CRSPs, or centrally-funded projects. M.Sc. participant training will be phased out as rapidly as possible in the U.S. as African faculties of agriculture expand their capacity to offer relevant, stable, and cost-effective training.

c. Commodity and Problem Research Priorities

Commodity and problem priorities are determined by the crops most important in the caloric intake of the rural and urban population, land area sown to particular crops, and current and prospective demand for the food crop in each respective ecological zone. The following commodities have highest priority for Africa: maize, sorghum, millet, upland rice, roots and tubers (cassava and potatoes), and edible legumes (beans and cowpeas). Relative importance would differ by ecological zones. Forages and trees are considered important in mixed farming situations, i.e., mixed food crop and livestock farming and agro-forestry. AID will not provide support for research on other crops (e.g., groundnuts, soybeans, horticultural crops) that are important in some local circumstances but which are relatively unimportant in terms of Africa's overall food needs.

2. Research Networks

Because of the large number of small countries in Africa, it is not cost-effective to approach agricultural research problems entirely on a country-by-country basis. Most of the national agricultural research systems in small countries are thinly-staffed and poorly-financed. Agricultural research is costly. A "critical mass" of scientists is needed to produce new knowledge through basic and applied research. In many cases they are not always available at the national level. It is, however, possible to build a critical mass of scientists through the collective joining of scientific manpower in the small countries and focusing their work on a specific problem. Problems that transcend national borders or even regional groupings often may be addressed more effectively by institutions that are interregional or global in nature. These instituitions, in turn, can provide support for national programs in specific program areas.

AID will facilitate agricultural research cooperation on a zonal basis to complement national research efforts. The major national research institutions producing new technologies will be encouraged to help implement collaborative networks with other national research systems and regional and international research centers. These collaborative networks will be inter-country working relationships facilitating the planning and coordination of research and the backstopping of national programs. In most instances, the IARCs will take a leadership role in development of networks. In some cases, it may be necessary to support small African regional institutions to coordinate with IARCs to lead network development. Over time, strong African national agricultural research systems must assume leadership roles in these scientific networks.

The development of networks in sub-Saharan Africa will plan strategic components of research to solve problems, foster the exchange of scientific knowledge, and facilitate cost-effectiveness; they will not be means for building large operational staffs or physical facilities. Several topics are especially promising for collaborative networks. On-farm research with a farming systems perspective is one of these. In addition, we plan to support, initially, four to six commodity networks, each in one or more zones. The following appear to have highest potential:

- Maize - Eastern Highlands, Western Coastal, Zaire Basin, and Southern Zones

- Sorghum and Millet -- Southern, Sahelian, Sudanian, and Eastern Highlands Zones
- Roots and Tubers -- Zaire Basin and Western Coastal Zones
- Edible Legumes (particularly beans and cowpeas) -- Eastern Highlands, Western Coastal, and Sahelian Zones
- Upland Rice -- Western Coastal Zone and Madagascar
- Forages in Mixed Farming Systems -- Sahelian, Sudanian, Eastern Highlands, and Southern Zones.

B. Faculties of Agriculture

We propose to improve the quality and increase the numbers of trained scientists to carry out research by supporting faculties of agriculture in four to six technology producing countries. The focus will be upon university building in higher agricultural education at graduate degree levels through the provision of support to university research, teaching, and linkages to agricultural production. Concentration will be upon agricultural sciences, other sciences related to agricultural production, agricultural and rural social sciences, food utilization, and university administration and management.

The ultimate objectives of support to higher agricultural education are twofold: first, to develop institutions of higher education and research that are responsive to commodity research priorities and agricultural production problems; and second, to produce a critical mass of well-trained, practically-oriented scientists willing and equipped to work on high-priority commodities and research problems.

Types and amounts of support will vary from institution to institution depending on their relative levels of development and areas of expertise and may include staff development and long-term training; classroom, laboratory, and dormitory facilities; curriculum and administrative development; research support; library development; support for networking with other professionals; and linkages to agricultural production. This will require a minimum of a 20 to 25 year commitment of support for each institution.

The following criteria will be considered in selecting faculties of agriculture:

a) Relative institutional strength in terms of quality of education offered;

b) Institutional recognition of the need for links among research, teaching, and agricultural production;

c) National budgetary support with a demonstrated history of steady support and reasonable per-faculty funding;

d) Potential for collaborating with and supplementing national agricultural research services and independent research institutes;

e) Potential for playing a leadership role in the country and region and a national policy which supports it.

The focus on faculties of agriculture is complementary to agricultural research and therefore the criteria also should take into consideration an attempt to strengthen at least one faculty of agriculture in each ecological zone; the zonal priorities for commodity and problem research; and the potential of selected faculties of agriculture to establish themselves to prepare professional resources to serve research needs at both national and regional levels, e.g., if maize research has been identified as a priority in Southern Africa, an AID-funded training institution in that region should provide professional support to such research.

Disciplinary priorities will be identified to support the commodity and problem priorities identified for each institution as well as the teaching function and agricultural production linkages of the university. Specific departments and units to be strengthened in each institution will vary from country to country. However, the following criteria will be applied in determining priorities upon which to focus support:

a) Priority attention will be given to development of those departments in scientific agricultural fields which most clearly meet the commodity and problem priorities identified for the institution, e.g., agronomy, soil science, plant pathology.

b) Choice of content focus will also be aimed at strengthening the institution's capability to conduct research and link that research to the agricultural production systems of the country and the region. Therefore, such departments as statistics and computer science may require strengthening in order to support viable research efforts while departments such as agricultural economics, rural sociology, and rural education may require strengthening to ensure linkage to agricultural production and farming systems research.

C. AID Funding Levels

Funding requirements for the plan to support agricultural research and faculties of agriculture in Africa can be separated into four components: (1) national agricultural research systems and zonal research networks; (2) faculties of agriculture; (3) IARCs, CRSPs, and other centrally-funded projects; and (4) a small set of U.S. Title XII institutions.

AID's experience in supporting national research systems and regional research networks in Africa provides some guidance in determining the funding requirements for these components, at least with respect to the Africa Bureau's and the S&T Bureau's roles in providing technical assistance, training, and essential equipment and commodities. For national programs, we plan to commit $50-75 million annually and $800 million over the next 15-year period. Of this amount, a relatively large proportion will be spent on (a) major efforts to establish a technology producing capacity in a handful of countries where this is warranted; and (b) major efforts to establish a technology adapting capacity in a handful of promising countries that are currently without such capacity. In other countries (the majority of cases), lesser amounts will be spent on training or making improvements to existing capacities to produce and/or adapt agricultural technology. For the zonal networks, we plan to commit $2-3 million per year for each of five networks, for a total of $10 to $15 million annually and $200 million over the 15-year period. In sum, a commitment of $60 to $90 million annually and $1 billion over the next 15-year period is planned for these two components. For the most part, these funds will be found through reallocations of resources.

About $20 million annually, or $300 million over the next 15-year period, will be provided to support the work of the IARCs, CRSPs, and other centrally-funded projects in Africa.

The anticipated cost of developing the faculties of agriculture in four to six countries is approximately $30 million per institution for the first 5 years with decreased support for the next 15 years or a total of $25 to $35 million annually for all the faculties over the first 5 years and perhaps $10 to $15 million annually over the remaining period or a total of $250 million over the 15-year period.

We do not have estimates yet of support to Title XII institutions.

We emphasize that these estimates are by no means the total resource requirements of research and faculties of agriculture in Africa. For example, we have not completely estimated the costs of participant training in the U.S. or more than the most minimal research investments in the moderate-to-low potential countries and lower priority commodities and problems. This underlines the importance of achieving major improvements in donor cooperation and the urgency of improving host country capacities to formulate and adhere to strong national research objectives and priorities.

D. Implementation of This Plan

This plan clearly implies some degree of restructuring of our assistance to African agricultural research. This restructuring is to be achieved in an evolutionary way, in the ordinary course of program and project development. For ongoing activities, the provisions of the plan will be incorporated into the scopes of work of teams undertaking mid-term evaluations and developing second-phase projects. Such evaluations will then be done with an eye toward the priorities developed in the plan. For new starts, the provisions of this plan will be factored into reviews of CDSSs and ABSs. This will ensure that programs and projects that are congruent with plan priorities receive appropriate support in the process of Africa Bureau and S&T Bureau resource allocation, and it will also ensure that inconsistent proposals are identified early at a time when differences of emphasis can still be effectively reconciled.

AID's policy paper on Institutional Development states that projects of this type may be authorized for ten years. This has important implications for the development of African capacities to undertake agricultural research and to improve faculties of agriculture because long-term commitments of this sort will engender fully supportive responses on the part of host country administrators and will call forth equally supportive responses from the U.S. Title XII community and other involved institutions. Thus there is a presumption in favor of ten-year **authorizations for future AID assistance to Africa in the areas of agricultural research and faculty development**.

VI. The Bottom Line: Food Self-Reliance

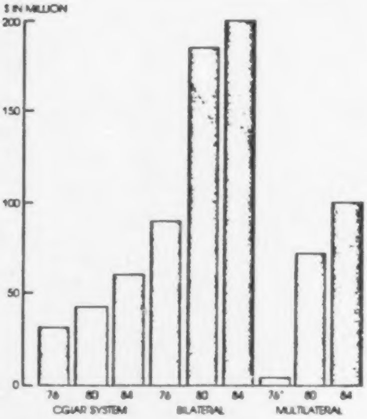
The ultimate objectives of U.S. assistance in food and agriculture are to enable African countries to become self-reliant in food, assure food security, and achieve economic growth.

There is no certainty that these objectives can be achieved by African countries. However, there is certainty that the objective will not be achieved unless fundamental efforts are initiated now.

Technology alone cannot do the entire job. Institutional innovations, policy supports, and infrastructure investments must occur if agriculture is to develop and benefits are to spread widely among rural populations. However, without improved agricultural technologies, resulting from research, few development programs will move very far or have lasting effect.

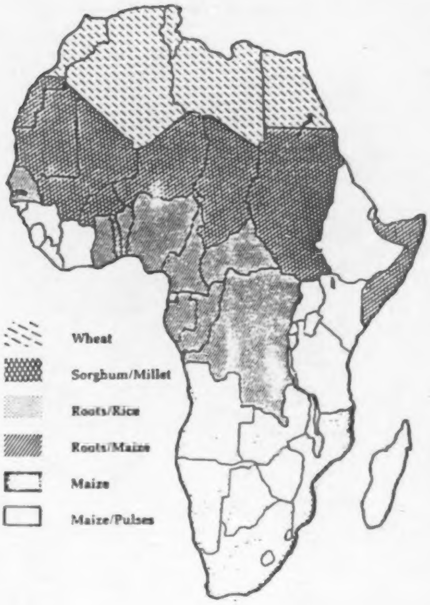
Annex A.

AFRICAN RESEARCH FUNDING



*1976 multilateral data incomplete
1984 bars are estimates based on partial 1984 reporting
Sources: World Bank, IFPRI, CGIAR

MAJOR CROP ZONES



Major Crop Zones and Supporting Data

Key	Food Crop Zone	Predominant Agroclimatic Condition and Geographical Location	Total Population (millions)	Total Agricultural Population (millions)	Agricultural Population Density per ha of Cultivated Area	Average Yield of Primary Cereals (kg/ha)	Number of Food Emergency Countries in Total Co[illegible]s for Each [illegible]on
▧	Wheat	Mediterranean Winter Rainfall	95.91	45.24	1.77	1219	1 of 5
▩	Sorghum/Millet	Semi-Arid Tropics—Sahelian Belt	141.08	88.88	1.42	544	9 of 11
░	Roots/Rice	Humid Tropical—Coastal West Plus Madagascar	29.84	22.92	2.07	1416	5 of 7
▨	Roots/Maize	Humid Tropical—Equatorial Lowland	81.29	53.14	1.82	802	5 of 11
▭	Maize	Sub-Humid Tropics—Central and Southern	24.11	16.26	1.43	1187	2 of 7
□	Maize/Pulses	Modified Tropical—Equatorial Highlands	93.48	74.00	2.49	1585	6 of 6

March, 1985

Sources of Data: World Bank, IFPRI, FAO and IADS. 1982 or latest available data.

Source: News from CGIAR, Volume 5, Number 1, March 1985

Annex B.

Production of Major Crops

Crop[a]	Average annual volume (thousands of metric tons) 1969–71	1977–79	1980–82	Average annual change in volume (percent)[b] 1969–71 to 1977–79	1977–79 to 1980–82	1969–71 to 1980–82
Cereals						
Maize						
Sub-Saharan Africa	12,132	13,438	13,774	1.3	0.8	1.2
Oil exporters	1,691	1,814	1,904	0.9	1.6	1.1
Other countries	10,441	11,624	11,870	1.4	0.7	1.2
Millet						
Sub-Saharan Africa	8,875	9,178	9,615	0.4	1.6	0.7
Oil exporters	2,870	3,083	3,299	0.9	2.3	1.3
Other countries	6,005	6,095	6,316	0.2	1.2	0.5
Rice (paddy)						
Sub-Saharan Africa	4,735	5,936	6,248	2.9	1.7	2.5
Oil exporters	380	856	1,268	10.7	14.0	11.6
Other countries	4,335	5,080	4,980	1.9	−0.7	1.3
Sorghum						
Sub-Saharan Africa	8,591	9,768	10,834	1.6	3.5	2.1
Oil exporters	3,632	3,768	3,783	0.5	0.1	0.4
Other countries	4,959	6,000	7,051	2.4	5.5	3.2
Wheat						
Sub-Saharan Africa	1,243	1,220	1,369	−0.2	3.9	0.9
Oil exporters	33	31	35	−0.8	4.1	0.6
Other countries	1,210	1,189	1,334	−0.2	3.9	0.9
Total cereals						
Sub-Saharan Africa	35,576	39,550	41,840	1.3	1.9	1.5
Oil exporters	8,606	9,552	10,289	1.3	2.5	1.6
Other countries	26,970	29,998	31,551	1.3	1.7	1.4
Oil and oilseeds						
Coconuts						
Sub-Saharan Africa	1,451	1,563	1,528	0.9	−0.8	0.5
Oil exporters	86	90	90	0.6	0.0	0.4
Other countries	1,365	1,473	1,438	1.0	−0.8	0.5
Groundnuts (in shell)						
Sub-Saharan Africa	5,194	4,826	4,325	−0.9	−3.6	−1.7
Oil exporters	1,699	503	625	−14.1	7.5	−8.7
Other countries	3,495	4,323	3,700	2.7	−5.1	0.5
Palm kernels						
Sub-Saharan Africa	711	664	743	−0.9	3.8	0.4
Oil exporters	306	310	362	0.2	5.3	1.6
Other countries	405	354	381	−1.7	2.5	−0.5
Palm oil						
Sub-Saharan Africa	1,112	1,321	1,372	2.2	1.3	2.0
Oil exporters	579	718	734	2.7	0.7	2.2
Other countries	533	603	638	1.6	1.9	1.7
Other crops						
Pulses						
Sub-Saharan Africa	3,861	4,207	4,709	1.1	3.8	1.8
Oil exporters	925	923	963	0.0	1.4	0.4
Other countries	2,936	3,284	3,746	1.4	4.5	2.2
Roots and tubers						
Sub-Saharan Africa	66,694	77,026	81,026	1.8	1.7	1.8
Oil exporters	27,674	31,488	32,056	1.6	0.6	1.4
Other countries	39,020	45,538	48,970	1.9	2.4	2.1
Seed cotton						
Sub-Saharan Africa	2,279	1,867	1,705	−2.5	−3.0	−2.6
Oil exporters	268	195	113	−3.9	−16.6	−7.6
Other countries	2,011	1,672	1,592	−2.3	−1.6	−2.1
Sugar						
Sub-Saharan Africa	2,303	2,806	3,203	2.5	4.5	3.0
Oil exporters	179	109	139	−6.0	8.4	−2.3
Other countries	2,124	2,697	3,064	3.0	4.3	3.4

a. Major crops that are totally or nearly totally exported (such as coffee, tea, cocoa, and rubber) are shown in table 24, which covers exports of agricultural commodities.

b. End point growth rate.

Source: The World Bank, Toward Sustained Development in sub-Sahara Africa. World Bank, Washington, D.C. September 1984.

Annex C.

Population Growth and Projections

	Average annual growth of population (percent)			Population (millions)			Hypothetical size of stationary population (millions)	Assumed year of reaching net reproduction rate of 1	Population momentum 1980
	1960–70	1970–82	1980–2000	1982	1990ª	2000ª			
Low-income economies	**2.4 w**	**2.8 w**	**3.3 w**	**217 t**	**278 t**	**386 t**			
Low-income semiarid	**2.5 w**	**2.6 w**	**2.7 w**	**31 t**	**37 t**	**48 t**			
1 Chad	1.9	2.0	2.5	5	6	7	22	2040	1.8
2 Mali	2.5	2.7	2.8	7	9	12	42	2040	1.8
3 Burkina Faso	2.0	2.0	2.4	7	8	10	35	2040	1.7
4 Somalia	2.8	2.8	2.4	5	5	7	23	2045	1.8
5 Niger	3.4	3.3	3.3	6	8	11	40	2040	1.9
6 Gambia, The	2.2	3.2	2.3	1	1	1	3	2045	1.9
Low-income other	**2.4 w**	**2.9 w**	**3.4 w**	**186 t**	**241 t**	**338 t**			
7 Ethiopia	2.4	2.0	3.1	33	42	57	231	2045	1.9
8 Guinea-Bissau	. .	. .	2.3	1	1	1	4	2045	1.8
9 Zaire	2.0	3.0	3.3	31	40	55	172	2030	1.9
10 Malawi	2.8	3.0	3.4	7	8	12	48	2040	1.9
11 Uganda	3.0	2.7	3.4	14	17	25	89	2035	2.0
12 Rwanda	2.6	3.4	3.6	6	7	11	47	2040	1.9
13 Burundi	1.4	2.2	3.0	4	5	7	27	2040	1.9
14 Tanzania	2.7	3.4	3.5	20	26	36	117	2030	2.0
15 Benin	2.6	2.7	3.3	4	5	7	23	2035	2.0
16 Central African Rep.	1.6	2.1	2.8	2	3	4	13	2040	1.9
17 Guinea	1.5	2.0	2.4	6	7	9	28	2045	1.8
18 Madagascar	2.2	2.6	3.2	9	12	16	54	2035	1.9
19 Togo	3.0	2.6	3.3	3	4	5	17	2035	2.0
20 Ghana	2.3	3.0	3.9	12	17	24	83	2030	2.0
21 Kenya	3.2	4.0	4.4	18	26	40	153	2030	2.1
22 Sierra Leone	1.7	2.0	2.4	3	4	5	16	2045	1.9
23 *Mozambique*	2.1	4.3	3.4	13	17	24	82	2035	2.0
Middle-income oil importers	**2.7 w**	**3.3 w**	**3.3 w**	**57 t**	**74 t**	**101 t**			
24 Sudan	2.2	3.2	2.9	20	25	34	112	2035	1.8
25 Mauritania	2.3	2.3	2.6	2	2	3	8	2035	1.8
26 Liberia	3.2	3.5	3.5	2	3	4	12	2030	1.8
27 Senegal	2.3	2.7	3.1	6	8	10	36	2040	1.9
28 Lesotho	2.0	2.4	2.8	1	2	2	7	2030	1.8
29 Zambia	2.6	3.1	3.6	6	8	11	37	2030	2.0
30 Zimbabwe	3.6	3.2	4.4	8	11	16	62	2030	2.1
31 Botswana	2.6	4.3	3.6	1	1	2	6	2025	1.9
32 Swaziland	2.7	3.2	3.9	1	1	1	5	2030	2.0
33 Ivory Coast	3.7	4.9	3.7	9	12	17	58	2035	2.0
34 Mauritius	2.2	1.4	1.6	1	1	1	2	2010	1.8
Middle-income oil exporters	**2.4 w**	**2.6 w**	**3.4 w**	**111 t**	**144 t**	**203 t**			
35 Nigeria	2.5	2.6	3.5	91	119	169	618	2035	2.0
36 Cameroon	2.0	3.0	3.5	9	12	17	65	2035	1.9
37 Congo, People's Rep	2.4	3.0	3.8	2	2	3	10	2025	1.9
38 Gabon	0.4	1.4	2.6	1	1	1	3	2035	1.7
39 *Angola*	2.1	2.5	2.8	8	10	13	44	2040	1.9
Sub-Saharan Africa	**2.4 w**	**2.8 w**	**3.3 w**	**385 t**	**496 t**	**690 t**			
All low-income countries	**2.3 w**	**1.9 w**	**1.7 w**	**2,269 t**	**2,621 t**	**3,097 t**			
All lower middle-income countries	**2.5 w**	**2.5 w**	**2.4 w**	**673 t**	**816 t**	**1,023 t**			
All upper middle-income countries	**2.6 w**	**2.3 w**	**2.1 w**	**490 t**	**588 t**	**718 t**			
Industrial market economies	**1.1 w**	**0.7 w**	**0.4 w**	**723 t**	**749 t**	**780 t**			

Note: For data comparability and coverage see the technical notes.
a. For the assumptions used in the projections see the technical notes.

Source: The World Bank, Toward Sustained Development in sub-Sahara Africa. World Bank, Washington, D.C. September 1984.

Annex D

Agricultural Research

AID Annual Funding Levels per Commodity - FY 1984
(Obligations)

	Regional		Bilateral		IARCs		Cent-Fund		CRSPs		Total Ann	
Commodity	$000	(%)	$000	(%)	$000	(%)	$000	(%)	$000	(%)	$000	(%)
Cereals	18,820	(84)	35,410	(70)	5,330	(37)	840	(42)	2,330	(44)	62,730	(72)
Roots/ tubers	540	(2)	3,730	(7)	2,300	(16)	180	(9)	-	-	6,750	(6)
Pulses (legumes)	2,500	(11)	2,250	(4)	1,870	(13)	140	(7)	1,640	(31)	8,400	(7)
Oilsds/ Hort	-	-	1,200	(2)	290	(2)	160	(8)	510	(10)	2,180	(2)
Animals	540	(2)	8,410	(17)	4,610	(32)	680	(34)	800	(15)	15,040	(13)
TOTALS	22,400		51,000		14,000		2,000		5,300		95,100	

Source: Africa Bureau and Science and Technology Bureau, AID

Annex E

External Funding for Agricultural Research to Africa 1976-80 1/
(Constant 1975 U.S. 000 dollars deflated from 1981 IMF Yearbook)

	1976	1980
Australia	--	--
Belgium 2/	n.a.	5,552
Canada	11,877	6,932
Denmark	--	59
Finland	11	5
France	30,589	42,090
Japan	32	297
Netherlands 3/	2,824	5,289
New Zealand	--	--
Norway	52	1,918
Sweden	608	1,737
Switzerland 3,4/	567	234
W. Germany 4,5/	4,827	4,827
United Kingdom 4/	978	302
United States 4/	5,800	72,000
Total Bilateral	58,165	141,242
EEC	n.a.	8,700
IBRD	2,660	18,500
IDB 5/	--	--
UNDP/FAO 4,5,6/	n.a.	23,300
Total Multilateral	2,660	50,500
Total Bilateral and Multilateral	60,825	191,742
CGIAR System	--	--
Overall Total	60,825	191,742

1/ Does not include base costs of technical assistance organizations of donor countries or agencies.
2/ Data provided for 1980 only.
3/ Includes contribution to core budgets of CGIAR.
4/ Includes some global projects not identified by region.
5/ Five-year total pro-rated by year.
6/ UNDP data for regions apply only to FAO; additional allowance for non-FAO projects included in 1976 and 1980 UNDP totals.

Sources of data: Country reports to FAO and/or IFPRI; World Bank, UNDP, FAO data supplied to IFPRI, IDB data supplied to IFPRI, Bilateral Agency Reports, Marchés Tropicaux (France). Compiled by Peter Oram of IFPRI.

Mr. **Edelman**. Agricultural policy changes are happening throughout Africa to provide the price incentives and other incentives for Africans. We are learning. We are now doing more smaller scale technology-type of projects throughout Africa. We have finally learned from mistakes of the past that we have to consult the farmers on what will work on the farm. And most of our projects are agricultural projects that now involve farming assistance research in those projects, so that we can ask the farmer and try it on the farmer's field on what works and what doesn't work, instead of sitting back and theorizing the approaches. We have learned from that.

Let me also point out that as bad as the drought has been in Africa this year—and, indeed, it was the worst drought in the Sahel than it was 10 years ago—the problem in the Sahel is not as bad as far as human life at risk as it was 10 years ago. We have learned a lot. We have got improved varieties. We have better infrastructure. And the governments themselves were better able to cope with the drought this year than was true 10 years ago. That is another sign of progress.

Let me finally just say, Mr. Chairman, if I may, that I very much share the concerns of this committee, this subcommittee that the highest priority in Africa has to do with agriculture production and research, and related areas. My concern is that the signals we are getting from the Congress as a whole don't share that concern. The authorizing committees for fiscal year 1986 have cut the amount of funds that we have available for our agricultural account worldwide and, indeed, the House Appropriations Committee has cut it back to its lowest level in many years. They cut our request by $117 million,[1] in fact.

And to me, the only thing I can see, while many people in Congress are asking us to do more in the area of agricultural production, research and all these related things, the Congress as a whole is saying no, don't do more, do less. Even what came out of the authorizing committees says at least do the same amount that you were doing last year. And this sends me, as trying to manage an Africa program, or the—Peter MacPherson, as the administrator, mixed signals about what this Congress really wants. It creates a great dilemma for us to figure out how do we do more while Congress is saying do less and what are the priorities that Congress would like us to do.

At that point let me just stop, Mr. Chairman, and, of course, I'd be glad to answer any questions you have. I know Mr. Sinding wanted to make just a few comments, if he may.

[The prepared statement of Mr. Edelman follows:]

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[1] The actual cut was $113 million.

STATEMENT OF
THE HONORABLE MARK L. EDELMAN
ASSISTANT ADMINISTRATOR FOR AFRICA
AGENCY FOR INTERNATIONAL DEVELOPMENT
BEFORE
THE SUBCOMMITTEE ON NATURAL RESOURCES
AGRICULTURE RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES
OCTOBER 31, 1985

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to discuss the Agency for International Development's (A.I.D.) assistance efforts and plans in sub-Saharan Africa on agricultural development, desertification and population. These are among the most important elements of A.I.D.'s program in Africa, all of which help Africans achieve economic growth. As recently as the 1960s, Africa was essentially self-sufficient in food production. The rapid decline toward external dependency for a large portion of its food supply -- nearly 6 million tons of emergency and regular food assistance this year -- and sharp deterioration in environmental conditions and severe economic crises, compounded with increasing population growth are adversities demanding urgent attention in order to set the stage for sustained development. The current famine intensifies this urgency. A.I.D. is undertaking a range of activities to deal with these issues.

Our increasing level of assistance reflects the Administration's growing response to Africa's needs.

Currently, the U.S. is the largest food aid donor, and the second largest bilateral donor to sub-Saharan Africa. Since 1981, our share of total development assistance to Africa has gone from four percent to 12 percent. In FY 1985, our regular assistance level exceeded one billion dollars as does our current request for FY 1986. In addition, in FY 1985 we provided nearly $900 million in emergency food and non-food relief aid to sub-Saharan Africa.

Not only has the level of financing gone up since the start of this Administration, but the direction and focus of our program in sub-Saharan Africa is, we believe, better targeted at the underlying development issues affecting sustained agricultural production. Our assistance strategy emphasizes agricultural-led growth. About 35 percent of A.I.D. funding to this region is allocated to increased agricultural production and another 43 percent goes to economic stabilization and reform which affects the agriculture sector.

Since the Subcommittee has indicated its interest in natural resource, environmental, agricultural development and population concerns, my comments are primarily limited to those topics. At the same time, I strongly believe that economic growth can only be attained by necessary structural adjustments and sectoral policy reform that provide production incentives and markets for Africa's farmers. A.I.D., along with other donors, has been instrumental in achieving substantial progress in these areas.

We are supporting agricultural pricing and marketing reforms in eight countries, encouraging privatization of parastatals and working with other donors to bring about more realistic exchange rates that directly stimulate farm production. Increasingly, we are tying our commodity import and sector assistance grants to economic performance criteria. One example of successful policy reform is in Somalia where the elimination of price controls led to a 40 percent increase in sorghum and banana prices. In Malawi, maize prices were allowed to increase by 55 percent resulting in a doubling of production in under one year and providing surplus for export.

Agricultural Development

Current conditions in sub-Saharan Africa dramatically attest to the lamentable state of agriculture on the continent. The recent drought has only served to underscore the long-standing, deep-rooted problems that exist in Africa. The rains have come, new crops are being harvested, but the problems still persist.

Population growth at 3.1 percent exceeds that of any other area of the world. Per capita food production continues to decline as it has for the last 20 years, and many countries have registered negative economic growth. In the meantime, cereal imports have more than tripled. With population growth outstripping production gains in agriculture, it is clear that the food imbalance in Africa will continue to grow unless steps are taken to bring population growth down and agricultural productivity up.

The expanding population in rural Africa has used up most of the good land and, with the increasing use of marginal land, contributed to deforestation and desertification. This disappearing land frontier, along with emerging seasonal labor constraints, means that future production increases will have to come from greater productivity from the better lands, rather than increased land and labor use. In turn, intensive farming of the more suitable lands demands more advances in farming technology.

For long-term sustained agricultural development, it is necessary to probe much deeper than the issue of water shortage and drought to examine unique characteristics of small-scale farming in Africa. The vast majority of farmers have small holdings and few resources. They form the basic production unit for African agriculture.

African agriculture is very complex. Farming is characterized by a range of small distinct ecosystems having tremendous diversity among them. Rainfall changes from arid to semi-arid to humid tropics with varying intensity and regularity. Less than two percent of the land in sub-Saharan Africa is irrigated. Soil fertility is generally poor but ranges widely, animal and plant diseases and pests are often location-specific, and weak institutions and transport infrastructure limit access to markets and technology. These factors have contributed to the slowness in developing technological breakthroughs and in disseminating them.

To reach the majority of African farmers, it is clear that increased emphasis must be given to arid and semi-arid farming for the foreseeable future, and measures must cope with environmental deterioration caused by tree removal, overgrazing, and lack of soil and water conservation. Research and experimentation should lead Africa's agricultural development. But more th~~an in the~~ past, basic farm management research with affordable technology and on-farm experimentation needs to be accorded higher priority.

Improved technology is necessary to achieve sustained agricultural progress on the continent. It requires a responsive research system that addresses the specific technological constraints of African farmers. Technologies typically must be location specific and sensitive to agro-ecological and socio-economic environments of the farmers who use them.

In order to more effectively utilize A.I.D. resources to improve agricultural productivity, we have issued this year a plan for supporting agricultural research and faculties of agriculture in Africa. It establishes priorities for research on six major food crops, directs support for basic research to eight countries with more advanced research capacity while strengthening others in agricultural technology adoption, fosters commodity research networks and sets the basis for support to African faculties of agriculture.

A.I.D.'s focus is on building indigenous capacities to deal with improved food crop technologies. The majority of support is for research conducted on staple food crops such as maize, sorghum, millet, pulses, roots and tubers with a goal to develop varieties having a high degree of tolerances to drought, insects and diseases, and a capacity to outproduce local varieties that farmers use today. For example, A.I.D. support to the national research program in Zambia has resulted in the breeding of two new hybrid and two improved open pollinated varieties of maize. These varieties which are being released to farmers for the 1985-86 crop year should bring 20 to 30 percent higher yields. African-based research by the A.I.D.-supported International Institute of Tropical Agriculture (IITA) has developed a variety of cowpeas that produces three times more than local varieties and matures 30 days sooner, thereby allowing it to use better the limited available rainfall.

In the Sudan an A.I.D.-supported joint effort of Sudanese researchers and scientists from the International Center for Research in the Semi-Arid Tropics (ICRISAT) has produced a hybrid sorghum variety that yields three times more than traditional varieties and grows well under low rainfall, near drought conditions.

The beginning of the rainy season is called the "hunger season" in many parts of Africa, as the past year's stored crops run out and the new season's planting is not yet harvested. Maize is one of the few staple foods carried over into the 'hunger season" and its supplies are often precarious. IITA has developed and tested a new variety that can produce ears 15 to 30 days before full season varieties are available, and it is resistant to a devastating virus disease.

A major deficiency in African agricultural research has been the lack of on-farm research. This weak link in the research chain is being strengthened by support to farming systems research. Most A.I.D. activities to assist national agricultural research institutions have a farming systems component to carry out experimental trials on farmers' fields. Thus improved technologies are now actually being tested under farm conditions and farmer management.

Networks to link national agricultural research systems with international agricultural research centers, Collaborative Research Support Programs (CRSPs) of U.S. universities and other research programs serve to accelerate research payoff as well as strengthen national systems. A further advantage of the networks is to join a "critical mass" of scientists to work on aspects of problems which transcend national borders. A.I.D. is directing its networking efforts to those top priority staple food crops identified earlier, which are grown by the majority of Africa's farmers. We are now working with six principal commodity networks.

Donor and host country coordination have greatly improved during the past three years. African-led efforts through the Southern African Development Coordination

Conference (SADCC) and the Semi-Arid Food Grain Research and Development (SAFGRAD) organization sponsored by the OAU are examples of A.I.D.-supported African regional initiatives to exchange information, conduct research, train and jointly plan activities of common interest among countries. Among international donor efforts, A.I.D. participates in a major way with financing and direct technical involvement in the Cooperation for Development in Africa (CDA) and the World Bank-chaired Consultative Group on International Agricultural Research (CGIAR). All of the thirteen international agricultural research centers are now working in sub-Saharan Africa, with greatly increased presence and research activities during the past 24 months. There is a close and continuing dialogue with the U.N. agencies at the country and regional levels to ensure that programs are harmonious.

Another aspect of the food production problem is the need to strengthen faculties of agriculture in order to increase the supply and skills of Africans to develop and transfer technology. Shortages of trained staff at the university and post-graduate levels are a major problem of national research systems. The only long-term solution to Africa's severe shortage of trained agricultural personnel is to expand the capacity and improve the quality of national higher education institutions. We are for example providing major support through the University of Florida to develop Dschang University in the Cameroon based on the U.S. land grant model of training, research and extension. Also, in Zimbabwe we are assisting the university improve its agriculture staff. Together with the World Bank we are reviewing plans and prospects for extending such efforts to 3 or 4 countries. We anticipate calling on Title XII institutions for more technical services to these African universities.

Technology generation is only useful when transferred and utilized. Since Africa's diverse ecosystems often necessitate local responses, private voluntary organizations are among those well suited to support the outreach efforts, and they are assuming an increasingly important role. In sub-Saharan Africa, 150 PVOs operate 2,700 projects, of which 1,133 or 41 percent can be categorized as agriculture and rural development in nature. These PVOs are able to take ideas and apply them at the community level. As an illustration, PVOs implement 24 percent of our forestry projects in Africa. They are training farmers on agroforestry techniques in Sudan, helping carry out a credit program for agriculturalists in Equatorial Guinea and delivering improved technology to Liberian farmers. About 15 percent of the Development Assistance budget for Africa is channeled through PVOs, as they have demonstrated the ability to become effective agents in the delivery of improved technology in Africa.

Combatting Desertification

Desertification is the major environmental problem afflicting Africa today. It is not an abstract, distant problem for Africans, but rather one which directly affects millions of farmers and their families throughout the semi-arid regions of the continent. A.I.D.'s response has been to commit about $200 million in the region over the past eight years to forestry and related natural resources and renewable energy projects.

Desertification, simply defined, means loss of the land's productive capacity through soil degradation and depletion, wind and water erosion or destruction of vital vegetative cover.

It may be useful to underline the key point that there is an important difference between drought and desertification. Drought is mainly a climatic event which we can monitor but still cannot control. Desertification is caused mainly by misuse or overuse of land by people and their livestock. It can occur well inland from the edge of the desert, and even in years of adequate rainfall, in areas where concentrations of people -- whether rural, refugees or livestock herders -- have overcut, overgrazed or overharvested the land.

The grounds of hope for reversing desertification lie in the fact that because it is primarily man-made, it can also be halted or reversed by human intervention. This can and has happened when countries, communities, and particularly individual farmers, are persuaded it is in their interest to do so.

This requires working with farmers to promote soil and water conservation and tree planting, at least cost and with the most widespread adoption. Farmers need to apply less capital intensive methods such as building small dikes, terracing, controlling runoff, and planting trees along the field edges or mixed with their crops in order to recapture environmental stability and rehabilitate soils in the desertified areas. Success of low-cost and fairly simple approaches depends upon well-prepared outreach programs that foster genuine local participation.

Farmers will realize the tangible and multiple benefits of higher crop yields by joining forestry with farming to obtain the shelter effect, additional organic matter from leaf litter, more nutrients from tree roots that go deeper, and products from multipurpose trees such as fruit, forage, firewood, medicines and nutritional ingredients in the family diet.

Soil and water conservation and selective tree planting measures cannot make more rain fall but they can:

- slow runoff, thereby increasing the availability of what rain does fall, sometimes by as much as 100 percent.
- improve soil texture and moisture retention capability.

- reduce soil erosion from wind or rain.
- provide biological fertilizers by fixing nitrogen and recycling other nutrients.
- in some cases, result in measurable increased food crop yields of 20 to 150 percent.

The best evidence that these efforts to reverse desertification can happen is that successes are already being seen in drought-ridden Africa. Here are a few examples:

- In Somalia, Sudan and Rwanda, around the desolate environments surrounding refugee camps, tree-planting projects carried out by PVOs with funding from A.I.D. are succeeding, with refugees doing the planting and maintenance themselves.
- In Senegal, A.I.D., together with other donors and international organizations, has completely controlled the sand dunes along the northwest coast. Farmer participation has been enthusiastic because these plantations protect some of Senegal's most productive horticultural areas, farmed by smallholders on the land immediately adjacent to the seacoast dunes.
- In Niger, an A.I.D.-financed project carried out by CARE has established over 350 kilometers of windbreaks protecting some 3,000 hectares of farm land. As a result, there has been a net increase of 23 percent in millet yields and farmers are eagerly trying to establish more windbreaks.

- Also, in Niger, our forestry land-use planning project has initiated a pilot forest management scheme in a natural forest area. Significant technical advances have been achieved in managing the forest for multi-purpose production -- fuelwood, fodder, and building materials. More importantly, the project has successfully promoted local village participation -- the key to viable systems of management and control for large areas of forests and public domain land throughout the semi-arid region.

Population

There has been growing recognition among African governments that demographic pressures are a major factor in slowing their economic development while contributing to desertification. They are increasingly receptive to population programs and more and more African governments are promulgating national population policies that will provide a foundation for national programs that will begin to reduce growth rates. The "Kilimanjaro Declaration" of the Second African Population Conference in 1984 reflects this concern in calling for "achievement of population growth rates that are compatible with the desired economic growth and social development goals". Nigeria, which has nearly one-fourth of the total population of sub-Saharan Africa, is expected to announce a new, national population policy before the end of the year.

A.I.D. has placed increased emphasis on its population program for Africa over the past four years. In 1983, for example, we had only four full-time population officers assigned to missions in sub-Saharan Africa. Today, there are 26 full-time or part-time staff in the field, and their ability to develop, design and implement programs and projects is evident in both the increased amount of funds now devoted to population programs and the number of projects being implemented. In FY 1985, two major new projects were begun in Kenya and Ghana. Three new country projects are planned for FY 1986. Total funding for bilateral population projects from Development Assistance has increased from $4.5 million in FY 1981 to $15 million in FY 1985, with $24 million planned for FY 1986. Including cooperating agencies, the total for FY 1985 was $60 million, or 21 percent of the total population account for A.I.D.

Social marketing projects are in the planning or implementation stage in four African countries (Nigeria, Ghana, Kenya and the Sudan), an important step in involving the private sector in family planning. We look forward to private sector involvement in another area as well, that of encouraging existing health insurance and health maintenance organizations to include family planning as part of their services, especially with employee organizations or those industries which provide health services for employees.

In many cases, family planning services can be joined with our major health initiatives to expand immunizations and provide oral rehydration therapy. We anticipate that the provision of all three interventions will have a synergistic result.

Family planning efforts form an essential part of the equation to reduce pressure on natural resources and desertification. The prospects for achievement of enduring development are dependent on reining in the rapid population growth while expanding agricultural production in sub-Saharan Africa.

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To turn around the existing situation and bring about sustained development is clearly a long-term task. At the same time, it is important to remind ourselves that nearly all the countries in which we are working were created only 20 to 30 years ago (in one case only five years ago). They are still going through the throes of establishing essential and reliable governmental, institutional, economic and social structures. We increasingly are planning development projects against a 20-year time frame, a perspective equal to the current age of several of the countries. Ten years ago, A.I.D. had programs in only 12 sub-Saharan African countries. Now we are in 46. So we too are relative newcomers, but we believe that, with persistence and realistic approaches, agricultural, environmental and population goals can be achieved. The job before us is to restore the balance between people, resources, development and the environment.

#0293Z

Mr. SINDING. Thank you very much, Mr. Chairman, members of the subcommittee. I appreciate this opportunity to describe AID's population program activities in Africa. Since time is short and the list of witnesses is long, I will keep my remarks very brief.

Mr. SCHEUER. Mr. Sinding, this is a very important subject to us. We consider it critical. We don't consider agricultural research, or even agricultural production, the key question. We consider the key question establishing equilibrium between people and food. We consider the key question how to provide enough food for the people in Africa. Therefore, you have to consider both ends of the equation, both food production and people. So, we consider what your area of responsibility is equally important to the last area that Mr. Edelman mentioned, which was food research and food production, which is terribly important. Neither of them can really be intelligently analyzed or evaluated without reference to the other. They are absolutely inextricably linked, because what we are talking about is per capita food availability. That is what starvation means. When you have mass starvation, it means that per capita food availability for those people has approached the vanishing point.

So, we are terribly concerned and very much interested in what you have to say, so don't feel you have to limit your remarks. Take the same 6, 7, 8 minutes that Mr. Edelman did.

Mr. SINDING. Thank you, Mr. Chairman.

Two weeks ago the subcommittee heard testimony from many expert witnesses on the population situation in Africa and its impact on natural resources and the environment. Today I would like to make just two points regarding the U.S. Government's efforts to help African countries deal with their population pressures. I would, of course, be pleased to answer questions that may go beyond these two points.

My first point is that within the last 5 years, and particularly the last 2 or 3 years, we have seen tremendous changes in the attitudes of political leaders toward population and family planning matters in Africa. Many countries which had been opposed to family planning have moved in the last couple of years to regard family planning services as an increasingly acceptable part of maternal and child health services. The change in Africa today is similar to the changes we saw a decade ago in Latin America, as many countries which had actively opposed the provision of family planning services responded to growing demands from their citizens to permit or to provide such services.

In much of Africa, the provision of family planning services is viewed as an important maternal and child health measure, not as a demographic control measure. All African countries present at the Mexico City International Conference on Population in 1984 agreed to the language of the final consensus document, which calls on every government to make available to all couples the information and means to enable them to voluntarily determine the number and spacing of their children. Increasingly we are seeing these changes in policy translate into changes in program. That brings me to my second point.

I certainly agree with the chairman's statement 2 weeks ago that the solution is not to throw money at the population problem in

Africa, and I think it is fair to say that after 20 years of experience in population program assistance we know how to provide resources in proportion to the capacity of developing countries to use those resources effectively. In other words, we believe that AID's experience in Africa and elsewhere enables us to know what to do to help African countries provide their people with access to family planning services.

While I agree with many who say the social and economic conditions in Africa are not conducive to rapid increases in contraceptive use as we have seen in some Southeast Asian and Latin American countries, we have found in many African countries significant proportions of the population who are ready and eager to use family planning services. The example of Zimbabwe was given in Mr. Brown's testimony. I would add now that a quarter of the population of Zimbabwe is using modern methods of contraception, and nearly 40 percent is using a combination of modern and traditional methods. There is evidence from Kenya that where family planning services have been made available, and this generally has been through private sector service delivery channels, couples are eager to make use of them. Thus, while desired family size in Africa is high and is likely to remain high for some years to come, we know from many surveys that couples desire fewer children than they generally wind up having. Beginning to close the gap between desired and actual family size represents an important step in improving the health of mothers and children and improving family well-being. The fact that AID has responded to requests to more than triple our support for population activities in Africa since 1981 is a very good indicator of the enormous changes we are seeing in African attitudes and practices in the population and family planning field.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Sinding follows:]

A.I.D. POPULATION ASSISTANCE IN AFRICA

Statement to the Hearing on Africa and
Hunger: Population

Subcommittee on Natural Resources, Agricultural Research and Environment
Committee on Science and Technology

Steven W. Sinding, Ph.D.
Director
Office of Population
Agency for International Development
Washington, D.C. 20523

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A.I.D. POPULATION ASSISTANCE IN AFRICA

1. Demographic Circumstances

Populations in Africa are among the fastest growing in the world (Table 1, Panel 1). The 42 sub-Saharan African countries receiving A.I.D. population assistance total 402 million in population and are growing at 3 percent per year. If this growth rate is maintained, the number of people living in these countries will more than double in the next 25 years. Africa's growth rate is significantly higher than that observed in other A.I.D.-assisted regions. Countries in the Latin America & Caribbean and Asia & Near East regions are growing at 2.4 and 2.3 percent per year, respectively.

Very high rates of population growth aggravate Africa's current economic hardships and dampen its prospects for economic progress in coming decades. The effect of rapid population growth is most immediately felt by families, communities, and nations in their efforts to provide adequate food, health care, and education for their children. If limited resources for these services are spread over larger numbers, the longer-term effects of a poorly educated and low health status work force can be severe. Unfortunately, many governments in Africa have adopted policies which have not stimulated the economic growth required to support the growing populations. Indirect effects of rapidly growing populations in a static economic environment are felt in many parts of Africa through excessive demands placed on agricultural production. Attempts to intensify land use have led to overcultivation, overgrazing, and deforestation -- and rendering these renewable resources unproductive.

Translated to a family level, based on current birth rates, African women can expect to have 6.6 children over their childbearing years. This compares to 4.9 children for women in the Latin America & Caribbean region and 4.4 children for women in the Asia & Near East region. Many births to African women are high-risk births, occurring to women under age 20, following a prior birth by less than two years, and following the fourth child. Births under these circumstances increase deaths and illnesses among children and mothers.

Opportunities for declining rates of population growth in Africa in the near term are based on a number of factors. Contraceptive prevalence rates are extremely low (Table 1, Panel 3) and family planning programs, with a few exceptions, have only recently been initiated in these countries. Individuals and couples throughout Africa do not have knowledge about, or reliable access to, contraceptive methods. As a result, whatever their personal inclinations, they find it difficult to practice family planning. A.I.D.'s objective is that 80% of all people have access to a wide range of acceptable contraceptive methods. On the other hand, crude death rates are also extremely high in many of these countries and will likely decline more rapidly than birth rates -- contributing in the short-term to rising population growth rates. Finally, the combined effect of modernization (with abandonment of traditional methods of contraception and improved capacity to support children) and poor delivery of modern contraceptive services has been observed in some African countries to result in higher fertility rates.

2. Policy Response

Twenty years ago, African countries did not perceive development to be hindered by population growth nor family planning as an effective health measure. As demographic information and research on Africa have become more available, government leaders have come to recognize the value of slowing population growth for both economic and health reasons. In the past twenty years, and especially in the past five years, many countries have adopted policies promoting lower rates of population growth and have begun supporting family planning programs as a means of lowering growth rates and of improving maternal and child health (Table 1, Panel 2). While we would hope that equal emphasis would be placed on policies which produce economic growth, we welcome attention to population issues where that leads governments to take action to increase availability of contraceptives and to help people who want to limit or space their children.

Of the 42 A.I.D.-assisted African countries, twelve (as of 1983) have explicit policies for lowering high population growth rates. While twelve may seem a small number, the populations in these twelve countries represent nearly 40 percent of all A.I.D.-assisted African populations. Many more African countries have formed population commissions to study population issues in anticipation of formulating national policies.

All twelve countries having plans to slow population growth provide direct or indirect support to family planning programs. Ten more countries, which have no explicit policies to lower population growth rates, directly support family planning programs. Government support of family planning in these instances reflects the acceptability of voluntary family planning programs as an important health intervention measure. The populations of countries which directly support family planning programs, for either reason, represent nearly 70 percent of all A.I.D.-assisted African populations.

3. A.I.D. Assistance

A.I.D. support for population programs in Africa has been increasing dramatically. Table 2 provides an overview of funding levels over the past five years. Support for Africa programs under bilateral and regional projects more than tripled over this five-year period. Support provided under central projects also increased more than three-fold, but in just a three-year period: FY 1983 - FY 1985. This compares to an increase of about 50 percent in A.I.D.'s total population budget over this five-year period.

Specifically, the number of bilateral population programs has increased from three in 1981 to eight in FY 85. Africa Bureau funding (bilateral and regional) has increased from less than $5 million in FY 1981 to over $15 million in each of the last two fiscal years, while central funding, through PVOs and NGOs, has increased from around $17 million in FY 1983 to $54 million in FY 1985. We have increased the number of population positions assigned to African missions from 4 to 26 over this period, and have increased the number of population positions in the Africa Bureau in Washington from 2 to 5.

The projects which A.I.D. supports cover the entire range, including: demographic data collection and analysis; efforts aimed at informing African leaders about population and its effects on development; training of medical and paramedical service providers; mounting public educational and communication efforts; and actual provision of the full range of contraceptive services. It is very important to observe that each year a larger proportion of our assistance goes to providing contraceptive services to an increasingly responsive clientele of African couples who have decided to space and limit births.

4. Lessons Learned

A.I.D.'s population assistance efforts in Africa have generated important lessons concerning the health impact of birth spacing, attitudes towards family planning, current contraceptive practices, and effective approaches to service delivery.

Health Impact of Family Planning: Recent survey data from a number of African countries confirm what has been learned in other regions -- that birth spacing has an important influence on both child survival and maternal health. When children are born less than two years apart, they are on average twice as likely to die as are siblings born after a longer interval. Spacing births at least two years apart can also lower maternal mortality rates.

Contraceptive Practice and Unmet Demand for Family Planning: Most family planning programs in Africa have only begun operations during the past five to ten years. As a result, current use of contraceptive methods among women aged 15-49 remains very low throughout the region. With two exceptions, the percent of women using modern or traditional methods ranges from one to twelve percent. In contrast, eleven of twelve countries surveyed in the Asia & Near East region and six of fourteen in the Latin America & Caribbean region have over 30 percent of women using some form of contraception.

While prevalence rates in Africa are generally low, areas where family planning information and services have been made readily available have experienced high rates of contraceptive acceptance and use. Zimbabwe is a striking example. Results from a 1984 survey showed 39 percent of married Zimbabwean women practicing family planning -- with 27 percent using modern and 12 percent using traditional contraceptive methods. Clearly, in Zimbabwe, we are meeting our goal of helping couples exercise their personal decisionmaking.

Traditional methods of birth spacing are widely accepted and practiced in many different societies in sub-Saharan Africa. A recent A.I.D.-funded survey in one region of Zaire, for example, showed over 90 percent of the women approving of family planning for spacing or limiting births and over 50 percent currently using a traditional method of contraception. Many of these methods, however, are less effective than modern methods and may become abandoned as populations become more urban and modern.

Although family planning programs are nascent in most African countries, there is evidence of substantial demand for family planning. Unmet demand for family planning has been measured from surveys in nine different African countries. In these surveys, between 30 and 64 percent of the women stated a desire to either limit family size or delay the next pregnancy.

Acceptability and Effectiveness of Community-Based Distribution (CBD): A.I.D.'s family planning assistance program in Africa has adopted innovative approaches to service delivery in response to serious deficiencies in health infrastructure, transportation and trained medical personnel. The primary emphasis has been on CBD schemes where lay or paraprofessional personnel are trained to provide family planning information and supplies at homes and in the community. A.I.D. has funded large-scale demonstration efforts as well as smaller pilot projects which use operations research techniques to test alternative approaches to improve the quality and accessibility of family planning services.

Community-based distribution of contraceptives has been tested in a wide variety of settings in sub-Saharan Africa, including Kenya, Nigeria, Sudan, Tanzania, Zaire and Zimbabwe. In all cases, CBD has been found to be safe, feasible and acceptable. Moreover, this approach has resulted in a substantial increase in knowledge, acceptance and use of modern family planning methods among the target populations. In Sudan, for example, use of modern family planning methods among married women of reproductive age increased from 4.8 percent to 11.2 percent in a remote rural area. In Nigeria, contraceptive prevalence increased 10-fold over a three-year period, from 1 to 10 percent in the target area. Similarly, in Zaire, the percentage of women using a modern family planning method (after a two-and-one-half year CBD effort) rose from 4 to 19 percent in an urban area and from 5 to 14 percent in a rural area.

These operations research projects have led to important policy and programmatic changes. Lessons learned from these initial efforts have been incorporated into expanded service delivery programs now underway in Nigeria, Sudan and Zaire.

The A.I.D.-funded experimental efforts have also provided useful insights into a range of service delivery issues, such as selection and training of field workers, contraceptive mix, number and type of health interventions offered, and program design and management. Among the most important findings for CBD programs in Africa are:

- Non-literate villagers can be trained to deliver family planning and basic health services as well as keep simple records.

STEVE SINDING'S TESTIMONY

- Levels of contraceptive acceptance and use will be higher if a variety of family planning methods are offered.

- Providing family planning information and supplies along with selected maternal-child health (MCH) services appears to be more culturally acceptable in some settings than if only family planning is offered.

- The number of different FP/MCH services offered should be limited to avoid overburdening the health worker and the delivery system.

- Phasing the introduction of various FP/MCH services in a CBD program can be an effective strategy.

- Short surveys, using a small sample and restricted interview schedule, can be a useful mechanism to obtain quick feedback on service delivery problems and solutions.

Through its family planning service delivery efforts in sub-Saharan Africa, A.I.D. has also learned important lessons concerning clinic-based programs, information and education strategies, and logistics and program management.

Finally, A.I.D. has undertaken projects which expand family planning service delivery in cost-effective ways through private sector mechanisms. In Kenya, a project is underway which encourages private sector health care providers and major employers to include family planning within their health care programs. For health care providers, family planning services can contribute to a healthier clientele and so reduce overall provider costs. For employers, these services can improve worker productivity and help reduce absenteeism. To date, the Kenya private sector project has launched thirty subprojects. A similar program is planned for Zimbabwe.

A.I.D. is also supporting activities to expand service delivery through private market places, through contraceptive retail sales (CRS) programs. CRS programs provide technical expertise and support for packaging and marketing contraceptives to retail markets. Major CRS efforts are underway or planned for Ghana, Sudan, Nigeria and Kenya. Preliminary assessments are scheduled for a number of other African countries.

5. Future Prospects

Over the past five years in sub-Saharan Africa important changes have occurred in the area of population and family planning.

There has been a dramatic increase in awareness among African leaders of the relationship between population growth and economic development. In a number of countries, this has been accompanied by the adoption of new policies to reduce population growth as well as strengthened government commitment to support the provision of family planning for improving national and individual well-being. Survey data point to a large and increasing number of couples who want to space or limit the number of births and who will use family planning services when they are made readily available. Demonstration projects testing innovative approaches to service delivery have led to expanded availability and use of modern methods of contraception in target areas.

While these developments are encouraging, the task of addressing population problems in sub-Saharan Africa will be a long and very difficult one. The challenge is indeed far greater than that in other regions. Africa as a whole continues to have the world's highest birth and population growth rates as well as the most serious socio-economic conditions. A.I.D.'s experience has shown that in order to have successful population and family planning programs and sustained fertility decline, a combination of factors must be present: strong commitment by host governments; favorable socio-economic conditions; effective public and private sector efforts; a well-developed infrastructure to deliver services; and strong program management. Of the 42 countries in sub-Saharan Africa, only Zimbabwe approaches these conditions.

A.I.D.'s population assistance for Africa must rely on multiple strategies, on innovative and flexible approaches and most importantly, on expanded and sustained action. Key components of this strategy area:

- Policy Dialogue: strengthening high-level support for population and family planning policies and programs; supporting the integration of population variables into development planning; and encouraging expanded government contributions to family planning.

- Technology Transfer: promoting new and improved methods of contraception and innovative strategies for service delivery; microcomputer technology; new management techniques; etc.

- Institutional Development: strengthening public and private sector capacities to design, implement and evaluate policies and programs.

- Private Sector: promoting innovation and expanded participation of private voluntary organizations and the for-profit private sector in the provision of family planning.

As awareness of population issues continues to increase and as new policies are developed, A.I.D. population assistance efforts will focus increasingly on program implementation and on expanded service delivery. The goal is to greatly expand the availability, accessibility, affordability and quality of family planning services throughout sub-Saharan Africa. Existing barriers of distance, cost, administration, culture and communications must be minimized. All channels of service delivery need to be tested and strengthened. This includes hospitals and clinics, CBD, commercial retail sales, for-profit health care organizations, factories, and markets, etc. Special efforts are also needed to improve critical areas of training, supervision, information and education, program management, supplies and logistics.

A.I.D. is responding to these challenges now with more population funds, technical assistance mechanisms and commodities for Africa along with expanded bilateral, regional and centrally-funded programs. We have also expanded our population staff in Africa to assure timely, effective and well-coordinated assistance efforts. A major and sustained investment of technical, financial and human resources is needed for long-term success in reducing Africa's high population growth rates and in improving the health status and well-being of the African people, and A.I.D. is committed to such a course.

TABLE 1.
DEMOGRAPHIC, POLICY, AND CONTRACEPTION INDICATORS FOR A.I.D.-ASSISTED COUNTRIES
IN SUB-SAHARAN AFRICA

REGION/Country	DEMOGRAPHIC INDICATORS (1985) a					POLICY INDICATORS (1983) b				PERCENT OF WOMEN USING CONTRACEPT & (YEAR) c
	TOTAL POPULATION (millions)	CRUDE BIRTH RATE	CRUDE DEATH RATE	RATE OF NATURAL INCREASE	TOTAL FERTILITY RATE	GROWTH RATE POLICY	PERCENT IN LOWER GR POLICY	DIRECT FAM PLAN SUPPORT	PERCENT IN DIRECT FP SUPPORT	
AFRICA	402.2	47	18	3.0	6.6	(12:LOWER)	38.9	(21:YES)	69.1	—
CENT/COAST WEST AFR	193.8	47	18	3.0	6.3	(4:LOWER)	60.1	(6:YES)	62.5	—
Benin	4.0	51	22	2.8	7.0	NONE	—	INDIRECT	—	—
Burundi	4.6	48	21	2.7	6.4	LOWER	—	YES	—	1 (77)
Cameroon	9.7	44	18	2.6	6.5	NONE	—	NONE	—	3 (78)
Central Afr Rep	2.7	46	22	2.4	5.9	RAISE	—	NONE	—	1 (77)
Congo	1.7	44	19	2.5	6.0	MAINTAIN	—	YES	—	—
Equatorial Guinea	0.3	43	21	2.2	5.7	RAISE	—	NONE	—	—
Ghana	14.3	47	15	3.2	6.5	LOWER	—	YES	—	1 (77)
Guinea	6.1	47	23	2.4	6.2	RAISE	—	NONE	—	1 (77)
Guinea Bissau	0.9	41	22	1.9	5.4	NONE	—	INDIRECT	—	1 (77)
Ivory Coast	10.1	46	18	2.8	6.7	RAISE	—	LIMIT	—	—
Liberia	2.2	46	15	3.4	6.7	NONE	—	INDIRECT	—	1 (77)
Nigeria	91.2	48	17	3.1	6.3	LOWER	—	YES	—	6 (82)
Rwanda	6.3	53	17	3.6	7.3	LOWER	—	YES	—	—
Sierra Leone	3.6	47	30	1.7	6.1	NONE	—	INDIRECT	—	6 (71)
Togo	3.0	45	17	2.8	6.1	MAINTAIN	—	YES	—	—
Zaire	33.1	45	16	2.9	6.1	MAINTAIN	—	INDIRECT	—	1 (77)
SAHEL/WEST AFRICA	36.0	49	22	2.7	6.7	(1:LOWER)	2.2	(3:YES)	24.4	—
Burkina Faso	6.9	48	[illegible]	2.6	6.5	MAINTAIN	—	NONE	—	—
Cape Verde	0.3	36	9	2.7	4.5	NONE	—	YES	—	—
Chad	5.2	44	23	2.1	5.9	NONE	—	LIMIT	—	—
Gambia	0.8	49	29	2.0	6.4	LOWER	—	YES	—	1 (77)
Mali	7.7	49	21	2.8	6.7	MAINTAIN	—	YES	—	1 (77)
Mauritania	1.9	50	21	2.9	6.9	RAISE	—	NONE	—	1 (81)
Niger	6.5	51	23	2.8	7.1	MAINTAIN	—	NONE	—	1 (77)
Senegal	6.7	50	19	3.1	7.1	NONE	—	INDIRECT	—	4 (78)
EAST AFRICA	132.8	47	17	3.0	6.9	(4:LOWER)	27.1	(8:YES)	94.5	—
Comoros Islands	0.5	46	16	3.0	6.3	NONE	—	NONE	—	—
Djibouti	0.3	46	20	2.6	6.8	NONE	—	INDIRECT	—	—
Ethiopia	36.0	43	22	2.1	6.7	NONE	—	YES	—	—
Kenya	20.2	54	13	4.1	8.0	LOWER	—	YES	—	8 (77)
Madagascar	10.0	45	17	2.8	6.4	NONE	—	YES	—	—
Mauritius	1.0	21	7	1.5	2.7	LOWER	—	YES	—	51 (81)
Seychelles	0.1	26	7	1.9	4.1	LOWER	—	YES	—	—
Somalia	6.5	47	21	2.6	6.5	NONE	—	NONE	—	1 (82)
Sudan	21.8	46	17	2.9	6.6	MAINTAIN	—	YES	—	5 (78)
Tanzania	21.7	50	15	3.5	7.1	NONE	—	YES	—	—
Uganda	14.7	50	15	3.5	6.9	LOWER	—	YES	—	—
SOUTHERN AFRICA	39.6	47	16	3.1	6.5	(3:LOWER)	8.1	(4:YES)	56.6	—
Botswana	1.1	50	13	3.7	6.6	LOWER	—	YES	—	8 (76)
Lesotho	1.5	42	16	2.6	5.8	LOWER	—	INDIRECT	—	7 (77)
Malawi	7.1	52	20	3.2	6.9	NONE	—	LIMIT	—	—
Mozambique	13.9	45	17	2.8	6.1	NONE	—	YES	—	—
Swaziland	0.6	48	17	3.1	6.5	LOWER	—	YES	—	—
Zambia	6.8	48	15	3.3	6.8	NONE	—	YES	—	—
Zimbabwe	8.6	47	12	3.5	6.6	NONE	—	INDIRECT	—	39 (84)

a: Population Reference Bureau, "1985 World Population Data Sheet", 1985.
b: United Nations, "World Population Trends, Population and Development Interrelations and Population Policies", 1985.
c: Compiled by Westinghouse Public Applied Systems, Demographic Data for Development Project, 1984.
Includes both traditional and modern methods.

Table 2

Agency for International Development

POPULATION ASSISTANCE FUNDING TRENDS - Africa
($000)

-- Funding for Africa bilateral/regional programs increased three-fold over period: FY 1981 thru FY 1985. Funding for Africa central programs tripled in just a three-year period: FY 1983 thru FY 1985. This compares to a fifty percent increase in A.I.D.'s total population assistance budget during these five years.

	Africa		
Year	Bil/Reg	Central	All Regions
FY 81	4,502	N/A	189,906
FY 82	7,342	N/A	211,050
FY 83	11,714	17,363	214,846
FY 84	15,545	23,705	240,000
FY 85	15,022 1/	54,178	288,180

-- Central support for Africa increased from 18 to 35 percent in the past three years: FY 1983 thru FY 1985.

--1 / In addition, $10 million was provided for population programs in FY 1985 from the Sahel Development Fund account, and $1.3 million from Zimbabwe from the ESF account.

-- The number of countries with bilateral programs doubled over the last five years, and will continue to increase with three new bilateral projects planned for FY 1986.

Population Bilateral Programs

FY 81	3	
FY 85	8	(6 from Population Assistance funds, 1 from the Sahel Development Fund and 1 from ESF)
FY 86	11	(8 from Population Assistance funds and 3 from the Sahel Development Fund)

Mr. **Scheuer**. Thank you very much, Mr. Sinding. That was forthright and very interesting testimony.

Mr. Love, do you care to add any remarks?

All right. We are going to go a little bit out of turn. I am going to yield my place to ask questions to our guest, Congressman Gilman, who has been such a major player and such a creative and thoughtful one in this whole field.

Congressman Gilman.

Mr. **Gilman**. Thank you. I appreciate the opportunity to be able to ask these questions at this time so that I can go on to another obligation.

Mr. Edelman, I am concerned about a statement you made: That the signals coming from the Congress indicate some lower funding than the funding levels that you have. What is the funding level at the present time by AID?

Mr. **Edelman**. Let me speak here also, Mr. Chairman and, Mr. Gilman, of the agencywide levels. For the last fiscal year, fiscal year 1985, we had $755 million available for our agriculture and natural resources account. We requested $700 million, and I believe it is $795 million[1] for fiscal year 1986. The authorizing committees only provided us, or authorized only $760 million. That compares to $755 million for the prior year; in essence, a straight line. And the House Appropriation Committee bill only provides $679 million. A remarkable reduction in the agriculture account. Now, for fiscal year 1986 we've made no allocation yet, because we don't know what the final numbers will be. We have not even begun to attempt to spread that by region or by country or anything else, so it is just the general signal of the macronumber that I was referring to.

Mr. **Gilman**. How did that compare to the prior year?

Mr. **Edelman**. $755 million was the fiscal year 1985 number.

Mr. **Gilman**. Compared to?

Mr. **Edelman**. $760 million in the authorization bill, $679 million in the House Appropriation Committee bill.

Mr. **Gilman**. And the prior year was what?

Mr. **Edelman**. 1985 do you mean?

Mr. **Gilman**. Yes.

Mr. **Edelman**. $755 million.

Mr. **Gilman**. Well, you are saying that the signals you are receiving from Congress indicates a much lower trend, but I think considering all the budgetary constraints that you are still at a fairly reasonable level and it doesn't signify major cuts. That there is still a great deal of concern and interest in maintaining a fairly reasonable level of funding.

Mr. **Edelman**. I have no trouble with—well, on the one hand, from what the authorizing committee said, that's correct. I mean it says to maintain that level, but it doesn't say to increase the level. My more important concern is the appropriation level which compared $755 million, for example, to $679 million, represents about an $80- or $70-some-odd million reduction in level of effort as opposed to even holding level our level of effort.

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[1] The amount requested was $792.4 million.

Mr. **Gilman**. But the Senate hasn't completed its work——

Mr. **Edelman**. That's correct.

Mr. **Gilman**. It would seem to me that we will probably end up at a fairly reasonable level, I would hope, before we are finished with the bill considering what the House had authorized and what had been asked for by the administration. I would hope that you don't interpret that as a signal and start on a downward trend because there is certainly a great deal of strong support in the Congress, both the House and the Senate, to try to maintain a reasonable level of funding for these very important programs.

I appreciate the statement that you strongly believe that economic growth can only be attained by necessary structural adjustments and sectoral policy reform, but provides production incentives and markets for Africa's farmers. As you are probably aware, my food for progress amendment to the farm bill enables to utilize Public Law 480 commodities as an incentive for countries to make necessary policy reforms; and, in addition, it also allows your agency to use these commodities to promote private sector enterprise in developing countries.

However, the private sector approach certainly isn't going to turn Africa around without the help of our PVO's. You have mentioned that some 15 percent of the development assistance budget for Africa is channeled through the PVO's in your statement. I feel that these organizations do have the absorptive capacity to more effectively utilize a much larger piece of the overall pie. Are you looking into using our good PVO's to become more significant players in the field in which they have the greater expertise?

Mr. **Edelman**. Yes, we are, Mr. Chairman. We have I think in the last year, and most of the PVO's I think would support this, had a closer work—tried to develop a closer working relationship between my bureau and the PVO's to figure out how we can work better together. We've got another meeting coming up in December exactly on that.

Mr. **Gilman**. What are your thoughts? Do you intend to increase it over the 15 percent, to channel it through the PVO's?

Mr. **Edelman**. It depends on what happens to our funding level. I would hope we can, if we can find ways to do this that are not as management intensive as they have been in the past. Management of the number of projects and of the PVO's is becoming—a number of projects throughout Africa is becoming an increasing concern of mine, to be sure that we have the staff to manage the whole process. PVO's are not management free. PVO activities are not management free. Some require less than others depending on the type of project, and also on the type—who the PVO is. Some are much more experienced in Africa than others.

But the administrator is interested in trying to find ways, and so am I, that we can work more through PVO's. There is a very appropriate role for the PVO's, which is in the technology transfer area, and that is what they can do very well.

Mr. **Gilman**. If I might interrupt you, the foreign aid bill—my time is running and forgive me for interrupting. The foreign aid bill requires you to undertake a study with regard to increased use of PVO's. What is the status of that study?

Mr. **Edelman**. I must say, Mr. Gilman, I don't know because it's being done by our food for peace office.

Mr. **Gilman**. Maybe Mr. Love can help us. Mr. Love, would you comment?

Mr. **Love**. I wanted to add that the Africa Bureau has initiated a study in collaboration with Interaction, the specific purpose of which—and this is an Africa Bureau-funded study—is to review what all PVO's are doing in Africa today, to canvas the PVO's in terms of what their interests are in terms of increasing their participation in Africa, and particularly to see if we can get a better balance between PVO's participating in the relief operations, which they are quite extensively engaged in, and encourage more PVO's to move into Africa into longer term development activities.

Mr. **Gilman**. When would we expect that study to be done?

Mr. **Love**. The study is in the process of being printed now. We would be happy to submit a copy to you.

Mr. **Gilman**. With regard to this new study that you have released today, or that you submitted to us today that was undertaken in May 1985, what was the distribution of that plan for supporting agriculture research and faculties of agriculture in Africa?

Mr. **Edelman**. We have distributed that plan to the World Bank, to every one of the international agricultural research centers around the world, to all of our missions in Africa, and——

Mr. **Gilman**. And has it been distributed to the Congress?

Mr. **Edelman** [continuing]. And, excuse me, also to the universities and to the other donors.

Have we distributed that directly to the Congress?

Only to individuals, Mr. Gilman. I don't believe——

Mr. **Gilman**. Is there some reason why you wouldn't want to distribute that to the Members of Congress?

Mr. **Edelman**. Absolutely not. I think——

Mr. **Gilman**. I would hope that you would. It is the first I have seen the study, and I think—maybe my office has been remiss in getting it to me. I don't know if my colleagues here have seen it. But I think you should make this available so that we could take a hard look. I didn't know there was some real good long-range planning at work.

And with regard to that could you tell us what is the long-range planning that the administration is undertaking with regard to some of the root causes of the famine in Africa?

Mr. **Edelman**. First of all, Mr. Chairman, let me apologize for the oversight. You're absolutely right——

Mr. **Gilman**. Forgive me, I'm not the chairman.

Mr. **Edelman**. Excuse me, Mr. Gilman, yes, I'm sorry.

We should have distributed that to all the members and we will do so. It is not a fault of your staff, it's our fault for not having done that, and we will do so.

Well, I think the plan lays out the concentration of effort in several key crops. It lays out the effort in developing agricultural research institutions, in laying out who does what between what the United States will do and what the other donors will do, and we are trying also to enlist the World Bank as a key player in this entire effort.

This plan will only succeed if all of the donors, and here I am talking about the Bank, the African countries, us and the other donors, all cooperate together to get at the agriculture—the constraints on agriculture.

Mr. **Gilman**. Well, you are talking about the methods now. What about the objectives?

Mr. **Edelman**. Well, the objectives are to increase food production.

Mr. **Gilman**. How?

Mr. **Edelman**. Through better, increased productivity. Primarily through lower level technology. The statements that have been made here about the concern about high-technology solutions I think are quite justified. What has happened in the past in Africa has been that we, and what I'm saying, I'm speaking of all the donors, have tried to take the high-technology approaches of Asia and transplant them to Africa, and they haven't worked. What we need to do now, which we now realize we need to do, is maybe use some high technology to develop low-input technologies.

Mr. **Gilman**. You are talking in report, and I'm just looking briefly at the executive summary, scanning it very briefly, that you're talking about increasing research and research capabilities.

Mr. **Edelman**. That's right.

Mr. **Gilman**. But what practical solutions are you suggesting?

Mr. **Edelman**. Well, the practical solution is to develop better varieties in Africa and to develop the Africans' ability to address their own problems.

Mr. **Gilman**. What about what Mr. Brown was talking about, soil, energy and water? Is anything being addressed in your approach in those areas? What about desertification? And what about deforestation?

Mr. **Edelman**. Well, desertification is a manifestation of the other problems. It is a manifestation of the population growth problem. It is a manifestation of the low agriculture productivity problem. And you address desertification through those types of approaches.

On the deforestation——

Mr. **Gilman**. Well, aren't these some of the underlying problems that would first have to be addressed before we could get to better grains or a different type of product or a different way of growing that product?

Mr. **Edelman**. Well, we are addressing those also in that plan. We are addressing forestation by trying to integrate. What we think should be done on the deforestation is to integrate forestry projects with our agriculture projects and not just give——

Mr. **Gilman**. Is that set forth in this plan?

Mr. **Edelman**. Yes, sir.

Mr. **Gilman**. OK.

Mr. **Edelman**. Yes. Soil and water is a focus in that. Someone earlier, I believe it was Mr. Brown, who commented on the fact that we need to focus on water use. I agree completely with that. We have to—in fact, what we are trying to do is develop better drought-resistant varieties. Water use is very important. I have seen water use projects myself when we were trying to train people in how to economize on the use water, not waste the water that is available. I agree completely with his comments that he talked about water has been thought of a bit like we did oil in 1970 and we have to—we view that as a more valuable resource. He is right on target.

Mr. GILMAN. I would be pleased to yield to the gentlelady.

Miss SCHNEIDER. Thank you.

I would like to just follow up on what Mr. Gilman is suggesting here to make sure that we are clear on this. Because he is asking, you already articulated the methodology, and Mr. Gilman was asking about the objectives. And I think that what we are both looking for, and many of us Members of Congress, is a clear articulation in the plan that you are looking toward a special emphasis on small-scale, affordable, resource-conserving, low-risk, using appropriate technologies and methods that are suited to the local environment and also suited toward traditional agricultural methods in Africa.

We want to make sure that that plan says that you are focusing, whether it be in deforestation or water resources, or whatever, that your focus is one that says our goal and our priority is to develop an environmentally sound approach and one that is community relevant.

Now, are those criteria articulated in developing the plan?

Mr. LOVE. Well, I don't think all of those criteria specifically are elaborated in the plan itself. We started out with a primary concern to move the research focus on Africa onto the African Continent and to begin to make it more relevant to the situation in Africa, to begin to recognize that the conditions in Africa, the nature of the rain-fed agriculture and the fragility of the soils, and so forth, did require a different approach to agriculture than we have faced in Southeast Asia and in Latin America.

Miss SCHNEIDER. But do you agree—let me just interject this before you get too far off. Do you agree, though, that "are more relevant to the situation in Africa," as you are saying, means essentially that there has to be an environmental criteria that is established in looking at the solutions and that there has to be a cultural, community relevant parameter that is followed?

Mr. LOVE. Yes, we do. And I think if you look at the plan you—we have added more of what we call Farming Systems Research into this plan, rather than just the basic crop research, in order to get this to the farm level to work with the farmers to find out what they are doing with complex multiple cropping systems and to be more relevant. And that is a fairly new element into the research strategy.

Miss SCHNEIDER. So then, in essence, what you are saying is the same thing that Mr. Gilman was pointing out. That you share those goals that I just mentioned that it be labor intensive, that it be resource conserving, that there be an emphasis on low technology, low risk, that sort of thing. Is that correct?

Mr. LOVE. Well, appropriate technology. We think, you know, there is fairly—most of the agriculture in Africa is small holder; most of it is labor intensive; there is very little mechanization. We are looking to building on that base, which we think at the current time is appropriate in Africa.

Miss SCHNEIDER. OK. So, in essence, what you are saying is that you agree with the philosophy that is articulated in Mr. Gilman's bill, H.R. 2782?

Mr. LOVE. Yes.

Mr. EDELMAN. Yes.

Miss SCHNEIDER. Yes, you agree with the philosophy. So can we conclude, then, that you are enthusiastically supportive of Mr. Gilman's bill and will assist him and me and Mr. Scheuer in the passage of that?

Mr. EDELMAN. No. Let me——

Miss SCHNEIDER. I would like to know why. If we agree, then what is your resistance?

Mr. EDELMAN. I think it is twofold, and "resistance" may not be the right word. The philosophy behind it I have no problem with. We are doing, or engaged in doing everything in the "Findings" section of that act, or that proposed legislation. I happen to—I agree with it. We're doing it. We don't think we need legislation to do it because we are doing it.

I, second, have a problem, I must say, about requesting increased funding for that.

Miss SCHNEIDER. But yet you earlier said that the funding which you were hoping for, which was $795 million for 1986, is nowhere near the figure that has been authorized, $760 million—or appropriated, $679 million.

Mr. EDELMAN. That's right. Well—yes.

Miss SCHNEIDER. So if you are not getting what you are looking for in terms of the agricultural research budget, and yet Mr. Gilman's bill is suggesting that certain moneys be focused on what has already been stated by you and your colleagues here, and that focus is on agricultural technology transfer that is low risk and environmentally sound, et cetera, then it seems to me that this ought to just fit your bill to a tee.

Mr. EDELMAN. Mrs. Schneider, I am wondering is there a way that you could pass a bill like this with the funds truly being additive. The budget process, both of the executive branch and the legislative branch, I don't see how they can be.

Mr. GILMAN. Would the gentlelady yield?

Miss SCHNEIDER. Yes.

Mr. GILMAN. Mr. Edelman, are you familiar with the funding we have proposed in the bill that——

Mr. EDELMAN. Well, I know you're proposing $75 million funding in the bill.

Mr. GILMAN. Yes, and Senator Kassebaum is suggesting that those funds be taken out of existing funding levels rather than new money. But it is a minor, comparatively speaking it is a minimal amount to get a program underway. And are you suggesting that that cannot be funded? Is that what your opposition is to the measure?

Mr. EDELMAN. Well, first of all, I'm saying that it is being funded because that is what we are now doing. So to say that——

Mr. GILMAN. I don't see—I have again skimmed this plan that you submitted today to the chairman. I don't see anything in here on environmental concerns, of trying to get to these root causes of the famine, of deforestation and desertification. You touch it lightly when saying there is a lot of arid soil around in Africa and that is related to the problem. But I don't see anything in your plan. You talk about a lot of crops, the need for clear objectives, and you talk about more research and some criteria, but I don't see any of that that touches on the real underlying environmental problems.

Mr. **Edelman**. Well, what your bill is getting at are projects, Mr. Gilman. I mean, the way it's worded is that we would fund projects. That plan doesn't go into projects, it goes into broader things. And what I'm saying is the projects that we are now doing do the kinds of things in varying degrees of what you're talking about. We are moving to the small-scale appropriate technology. We are doing the—trying to find more appropriate and innovative methods. We are constructing dams and doing soil conservation projects. I've seen them myself out in Kitui Province, for example, in Kenya, where I have watched women doing the terracing work.

Mr. **Gilman**. Mr. Edelman, if I might interrupt again. Somewhere in this report do you address these environmental issues?

Mr. **Love**. I am sorry, Mr. Gilman. In putting that report together we tried to concentrate on the basic concerns that we were running into in developing an agriculture research strategy and the related human resources.

Mr. **Gilman**. Fine. And in that research do you talk about researching the environmental issues?

Mr. **Love**. It interfaces with the environmental issues. We have working groups also working on a water-related situation, looking at deforestation. We did not want that paper itself to try to become a complex strategy for all of the problems related in Africa. It is one piece of a broader mosaic, and it does not go into deforestation, does not go into——

Mr. **Gilman**. Well, is it touched on in here someplace?

Mr. **Love**. It touches on it to the extent it mentions it as an important consideration, but that's basically at the crop-related issues and trying to focus that so we can get some answers out of the diversity that, and overlapping that was present in the research strategy in Africa in recent years.

Mr. **Gilman**. Do you agree, Mr. Edelman, that out of the Brown and Wolf report, Worldwatch Paper 65, this statement, that reversing Africa's decline will require carefully orchestrated national efforts to organize millions of people to plant trees, to build soil conservation terraces, and to plan families? Do you agree with that statement?

Mr. **Edelman**. I agree—I'm not sure that it would require millions. I agree that it requires carefully planned national plans to do those kinds of things and to address those things. That is what I was speaking of as the national wills of the Africans to do those kinds of things.

Mr. **Gilman**. And you agree with those methods, of planting trees, building soil conservation, family planning?

Mr. **Edelman**. In the right way. I don't believe you go out and just plant forests. I don't—I think that what you have to do when you do tree planting exercises, as we're planning, trying to do one, for example, a major new project in Senegal, is you cannot—it will not work if you—we have a bunch of people going out and just planting trees in some national forest. Africans, if the tree doesn't belong to them, they'll chop it down. They'll chop down somebody else's tree. They won't chop down their own tree. They need to plant trees that belong to them and that there is some relationship between that tree, and, in effect, an ownership problem with that tree.

Mr. GILMAN. Where do you touch on that in this report?

Mr. EDELMAN. That is not touched on in that report.

Mr. GILMAN. Where do you touch on soil conservation in this report?

Mr. EDELMAN. It is not directly touched on in that report, either, because of what Mr. Love said, it's a broader way——

Mr. GILMAN. Where do you touch on water conservation in this report?

Mr. EDELMAN. It doesn't touch directly on water conservation.

Mr. GILMAN. Thank you, Mr. Chairman.

Mr. SCHEUER. Mr. Edelman and Mr. Sinding, let me tell you that although you have come in for some tough questioning from the members here, because they have problems that deeply concern them, I am frankly impressed with what you are saying and what you are doing. I don't see any effort on the part of this administration to kill the foreign aid program. I think that was a concern of all of us. There are certain groups in this country, very conservative, ultra-right wing groups, who demagogue the foreign aid program into the ground. They would like to kill it. The "quart of milk for every Hottentot" approach. That was a remark that may be a little before you time that emanated from the pearly lips of Clare Booth Luce about 40 years ago. That was her response to the principal of the foreign aid program. I see no effort on the part of the administration to kill the foreign aid program, and I applaud the administration for that.

I do see some effort to cut down funding. I wish that didn't take place, but all kinds of things are being cut down in this environment of acute funding limitations in which we are functioning today. I do see some effort on the part of the administration to redirect some programs. I oppose that, and we are going to discuss one of them in the next few minutes. But by and large, I think the administration has done a pretty workmanlike and pretty faithful and loyal job of sustaining a foreign aid program that has ennobled America's image around the world since World War II, and, of course, going back to the Chinese aid effort that Herbert Hoover led during World War I. I think it ought to be said that some credit is due there.

As to your testimony it is certainly encouraging. I just totally agree with you that Africans are going to have to do it themselves. And the main initiatives, and, indeed, the main investment is going to have to come from within Africa. We can help, but our help is got to be on the fringes——

Mr. EDELMAN. Exactly.

Mr. SCHEUER [continuing]. And at the margin. We can help with technology transfer, we can help with some guidance, but if the leadership isn't there, if the will to progress and achieve isn't there, they are in for trouble.

Now, the fact is that you are quite right, things have improved. And sometimes we misperceive the situation. I took a trip across the length and breadth of Africa in 1976, and I visited about 8 or 10 countries. At every country I was told—and I was looking at family planning clinics. At virtually every embassy I was told by the ambassador, now I know you're going to talk about population and family planning and you've got to tread on eggs. This is an extremely delicate and sensitive project—program that you are talking about. You just have to understand that there is an awful lot of opposition to it. I'd say thank you. Then the pop aid officer would drive with me to the health ministry or the development industry or what, and he'd say, well, the situation may not be quite that bad.

The first thing that would happen when we get to the ministry was they would tell us what their family planning program was, and they'd say, can you help? I remember when I was in Dar es Salaam in Tanzania they wanted to set up a thousand rural family planning clinics that would cost about $1,000 for the building. Then they wanted a package, a scale to weigh new babies, and they wanted an incubator. They wanted a refrigerator, and they wanted a machine to sterilize equipment. The whole thing cost about $4,000 plus the cost of the little, tiny little structure, which was about a $1,000, so the whole thing came to about $5,000, and they wanted to do a thousand of them, so that was $5,000,000. They couldn't wait. I hardly had time to sit down in my chair before the health minister said can you help us find the $5 million?

So sometimes we overemphasize the sensitivity. Enormous progress has been made. I am chairman of a committee of parliamentarians around the world called the Global Committee of Parliamentatians on Population and Development. We have had family planning conferences all over the world, several of them in Asia, several of them in Latin America, several of them in Europe. We are now scheduling several of them in Africa, in Zimbabwe, next May. It is a conference organized by Africans for Africans with very little intervention from Americans. We are, the non-African parliamentarians are way in the background. We are giving them some advice, some counsel, some funding, some technical assistance; but it is Africans, African parliamentarians and African chiefs of state who are supporting this conference. Now that could never have happened 10 years ago, or even 5 years ago. So I quite agree with you, there is a change taking place; and what you describe to us, the change taking place in Zimbabwe, is quite typical of that. They are beginning to face up to the stark realities of the imbalance between population, the exploding rates of population growth and food production.

Mr. Edelman, let me ask you a question about Mr. Sinding's testimony. On page 10, top paragraph: "Levels of contraceptive acceptance and use will be higher if a variety of family planning methods are offered."

Do you agree with that?

Mr. **Edelman**. I am not an expert on the subject, Mr. Chairman, but I would assume that—I think I would agree with that.

Mr. **Scheuer**. Certainly the preceding witness, Lester Brown, felt that very strongly. Let me requote what he said: "Family planning programs that work best offer a full range of contraceptives and sterilization for both males and females. When couples are satisfied with a contraceptive method, continued use is far more likely."

We had a great deal of testimony to that effect yesterday when we had a group of women witnesses testifying on the role of women.

What is your view on the change of—now this may be an unfair question, and if you wish not to answer, that you can't answer because of strictures that have been laid upon you by the administration—tell me and we will go on to other matters. OK?

You heard the question that I asked Lester Brown. What is your view on the change of policy that took place on July 8 and the legislation that was introduced yesterday cosponsored by myself and Mrs. Schneider and, I would assume, Ben Gilman, that would return our policy to the pre-July 8 policy, which would require all providers of family planning abroad, whether or not they themselves offer the full range of contraceptive options, to advise young couples, young women, on the availability elsewhere of other contraceptives options or refer them to other family planning clinics for such advise?

Mr. Edelman. To be absolutely honest with you, Mr. Chairman, I was not involved and do not know even, to be honest, all the reasons for the change in the policy. Therefore I do have not really an opinion, to be very honest, on either the change in the policy, and of course the second part you can guess what my view would be on the legislation introduced yesterday; that is, there is no way I could support the legislation that would change the policy.

But Mr. Sinding at least can explain, if you would like, the reasons for the change in policy which I, honestly, have not gotten into.

Mr. Scheuer. Mr. Sinding, would you reply? What is your view on the change in policy? And do you support the effort that a number of us are making to revert now to the pre-July 8, 1985 policy?

Mr. Sinding. Mr. Chairman, because of the career status I hold and the role I play in the program, I would prefer not to express my personal views on either the policy or the efforts currently underway to change it. What I would like to do is explain why the change in policy was made, the rationale behind it and the Administration's position on it.

As you are well aware, Mr. Chairman, a number of groups which are interested in providing natural family planning services in support of AID's programs around the world object on moral grounds to methods other than the natural method, as they call it.

Mr. Scheuer. Well, Mr. Sinding, I am interested in your testimony and I want you to proceed, but I think it should be clear that some providers of natural planning provide also information on other options, too.

Mr. Sinding. That is correct.

Mr. Scheuer. They provide the full range of family planning options. I am sure you are aware of that. I am sure you have visited projects, as I have, operated by nuns, perfectly wonderful people, including American nuns, who are the most marvelous ambassadors for our country, where they teach, of course, the natural methods and abstinence but also offer other options, too.

Are you aware that that is being done?

Mr. SINDING. Yes, Mr. Chairman, I am aware that there are many natural family planning groups that are willing to refer for other methods.

Mr. SCHEUER. Right.

Mr. SINDING. There are other natural family planning groups that are not.

Mr. SCHEUER. That is absolutely correct.

Mr. SINDING. The AID, in looking at this question, felt that there isn't in the developing world now widespread enough understanding and availability of the full range of family planning methods, a principle to which we continue to subscribe very strongly; that an exception could be made for those groups who do object to referral for other methods without doing damage to the rights of patients, to the rights of individual couples to have access to the full range of information about methods.

At the time that Administrator McPherson announced his decision to make this exception, he also said that we would very carefully watch the situation over the next several months to see whether in fact that assumption was correct. We are doing that, Mr. Chairman. We are following with great interest meanwhile the current discussion in Congress on that policy.

Mr. SCHEUER. Yes. Mr. Sinding, I respect your testimony, and I respect you. I take it that you stand on the sentence at the top of page 10 of your testimony. The simple declarative sentence, and I will read it again:

"Levels of contraceptive acceptance and use will be higher if a variety of family planning methods are offered."

Mr. SINDING. Yes, Mr. Chairman, I stand by that, and I believe that the exception to the policy does not materially change that situation.

Mr. SCHEUER. All right. Look, I respect your views and I respect the explanation you have given us as to the change. Let me just make one footnote. There is far from a sufficiency of family planning services in sub-Saharan Africa. You might say there are family planning clinics in most of the big cities, so that if a woman wants to go to the family planning clinic in the Mamayamo hospital, if she waits long enough she will get service.

But as far as rural sub-Saharan Africa where about 80 percent of the women are, there are vast areas where there is nothing. Isn't that true?

Mr. SINDING. Yes, Mr. Chairman.

Mr. SCHEUER. So perhaps one could feel that in an administration where there has been an excellent and commendable concentration on cost effective methods of delivering all kinds of human services at home and abroad that one wonders why they would want to continue funding a kind of service delivery that is egregiously uneconomic and un-cost-effective as Lester Brown pointed out. He explained that as a taxpayer he was offended by the waste of funds involved in setting up one family planning clinic that offered only one service and then relying on word of mouth or something to get the women who didn't find that particular system appropriate for them to find another type of contraceptive option. But that is neither here nor there. I commend both of you on your testimony.

One more question. We had three witnesses yesterday in a panel entitled "The Role and Status of Women," or words to that effect: Perdita Huston, an author and journalist who has lived for many years in sub-Saharan Africa; Elise Smith, who is executive director of the Overseas Education Fund; and Dr. Christine Obbo, a Ugandan, who is assistant professor of Anthropology at Wheaton College. They all testified that the role and status of women was key to—that improvements in the role and status of women were key to improvement in the production of food; that they needed more education; they needed to have access to technology transfer; they needed access to the education system, they had to become literate; they needed access to the job market, to credit markets; they urgently needed the age of marriage increased, so that women would understand that society holds forth a lot of life roles for them other than persistent annual child-bearing. That it is not enough just to offer contraceptives. Unless you can give them an incentive to give up the role of child-bearing to do something else, they are not going to use the contraceptives. That you have to reprogram them from thousands of years of programming that their worth on this Earth was determined by the consistency with which they produced another child each year.

They urged and emphasized, for example, that women be placed in key roles in planning and administering village projects. That women be placed in key roles in designing and in offering and in delivering agricultural extension services. Since 78 percent of the food is raised by women, they said, it is absolutely essential for women to be better represented among the agricultural extension workers so that they can work with other women.

There was discussion that at the time they were being given advice as to how to maximize food production they also could give some advice on how many people that little plot of land could ultimately support. So that they could help each woman, help each young couple, achieve their own family equilibrium between land and food production capability and their own family size.

I would like to ask each of you, Mr. Edelman and Mr. Sinding, to tell us whether you agree that the status of women is as key a role, more or less approximately, is also a key role as the environment concerns are that have been expressed by Lester Brown and both of my colleagues, and that perhaps more attention should be given in designing projects for sub-Saharan Africa to make sure that women are drawn into the process in key roles so that there are some role models across the continent of women in key, significant positions and that an effort be made to open up the world of education, job training, employment, credit, and the like to women.

Mr. **Edelman**. The bottom line—I would be glad to answer that, Mr. Chairman. The bottom line is I agree with those statements, to start off with that way. I mean, I would qualify it in some way, but fundamentally the basic point that is being made there I would agree with—about opening up the opportunities for women in Africa, that they are key to economic growth or key to agricultural production, they are key to so many things—that is absolutely right.

Second, while we do spend I believe increased attention on the role of women in agriculture, we try though not to focus, to select them out as a special group, but rather to try and integrate them. I know that Mrs. Schneider is particularly concerned about the use of women as agricultural extension agents, and I must say we have only recently begun to focus on that, and we are probably not doing as much as I would like us to do on that subject. I think that is something that we can and should do more on.

We have several problems in doing it. Before I get to the problems, one other thing about the role of women and managing village level projects. Earlier this month—this is still October—earlier this month I was in Malawi where I personally saw one of the best water projects that I have ever seen, and probably one of the best in the world, whereby we are providing water to about 100,000 people—clean water. But the bottom line is that this is a pipeline that starts high up in the mountains and goes down to villages over a 25-mile radius.

The AID is paying only for the supplies. The villagers themselves do the construction. At each of those villages the management of that tap and the management of that water is entrusted to the women. I met several of the women at the different stops who were the managers of that. It wasn't the men who managed the water use. It wasn't the men who made sure that things were working properly. Interestingly enough, it was the women who were in charge of managing the water use in the villages in this project, which since you mentioned management I thought that was very interesting and very atypical.

There are great problems, however, in AID trying to do more with women. That doesn't mean we shouldn't try, and we say that, and we should keep trying. Of course, it is a lower literacy rate for women and there are sociological reasons for that. As you mentioned, you have to change centuries of thinking about the role of women. And there is a problem, too, in getting women in more prominent positions. How do you overcome the problem of women being the people who till the fields? You have to get them out of the fields to train them, for example, when they are supposed to be on the farm tilling them.

But fundamentally, the major obstacle we run into is this ethnic, sociological—call it what you will—kind of problem that it is very difficult for any Western country to go in and tell them what they should and shouldn't do. Progress is being made. There are women cabinet ministers increasingly in African countries. There are advances, but it isn't what I would like, or we would like to see to help Africans. But it is a process of trying to educate them.

Right now about 10 percent, I believe, or so of all of our participant trainees are women. We have just—when was it?. Earlier this year I signed a new project for our manpower development program in which we have set a goal in that of trying to get 33 percent of the participants to be women. It is going to be very difficult to meet that goal, but at least we have set it out and we will see how close to that we can get. And I would assume if we come close to that in this project, which is about a 3- or 4-year project, then next time we will up that goal, to keep pushing people to the forefront to try and find and train more women to have a more productive role in the African societies.

Mr. SCHEUER. Mr. Sinding?

Mr. SINDING. Mr. Chairman, as a long-time student of population issues, I know that you are aware that the role of women is absolutely central to what happens to fertility and to the acceptability of family planning. From my own experience in a number of Asian countries, and more recently in Africa, I have become personally convinced that until alternative roles for women are found they won't be interested in limiting family size. Until an alternative to motherhood and child-rearing becomes available to them, large families and a maternal and nurturing role will continue to be the central role for women.

For that reason, the agency has, ever since section 104(d) of the Foreign Assistance Act was passed back in the mid-1970's, attempted in a wide variety of ways to integrate the role of women into all of our population activities and to look at what we do in development generally as it has an impact on population growth rates.

We believe that the provision of family planning services to that proportion of the population which is interested in limiting family size is a key factor in changing and improving the role of women. Because without access to family planning services it becomes very difficult for many women to cease having children that they don't want and to engage in other productive activities.

So I would say that both in the legislation which Congress has passed and in the policies and practices of the agency we are very much in accord from a population standpoint with the statements you referred to in yesterday's hearing.

Mr. SCHEUER. Congresswoman Schneider.

Miss SCHNEIDER. I would like to make a statement, and then I have about 19 questions I need to ask. But let me begin with a very brief statement because I think it is critical that the record reflect the facts and the numbers, with all due respect to my chairman. And I hate to do this, but I know that when I am finished you will be glad that I did.

Despite the apparent appearances that AID is doing well and the administration and Congress are adequately funding AID, regrettably the numbers do not lie, and we just checked out the budget for 1985. But this is for AID overall, not just your Department, $8 billion in 1985, and the request by the administration for 1986 was $6 billion. Two big b's I think are significant.

Well, what is even more significant is that the House Appropriations Committee called for the expenditure of only $5 billion. Where we see also a decrease on the part of the administration's request is specifically in the area of the population budget. The population budget in 1985 was $290 million; in the request was $250 million. So that if we are talking theory here and say that we agree on various principles, I think it is significant that we put our money where our mouth is, and also the requests. And regrettably those requests and actions on the part of Congress, too—we are also in that position—do not reflect the needs that all of us seem to be here agreeing on.

Now, I would like to follow along some of the lines of questioning that the chairman was pursuing having to do with women and population, and some of your remarks, Mr. Sinding.

A recent Food and Agriculture Organization report, and I would think you probably have seen this report, states that there are as many as 65 developing countries which will be unable to provide adequate food for their people by the end of this century. Because there is little likelihood that food production can keep pace with the population growth of these countries, the report goes on to say that accelerated and effective family planning programs are their best hope.

I just wondered if, in trying to learn more about the way you operate, is the Office of Population giving priority consideration to these countries, these 65 that have been identified? Are you numerically identifying which ones have to be top priority as a way of seemingly addressing the greatest crises first? And so if you do have a priority ranking, how are you going about addressing it?

Mr. SINDING. Are you asking for a response now to this last question?

Miss SCHNEIDER. I am asking for a response to the question that the FAO did a study, they say that 65 of the developing countries are going to be unable to provide adequate food for their people by the end of the century. They say that food production cannot keep pace with the population growth, and the report stresses an increase of emphasis on effective family planning programs. And they go on to say in this report how family planning programs really are the best hope in addressing the food shortage problems.

So my question to you is have you taken those 65 nations that have been listed by the FAO report, and do you have your own ranking systems saying yes, this is where we have to really concentrate on population growth? And what methodology are you also using to address this problem that has been articulated by the FAO?

Mr. SINDING. The answer to that question is not a simple one, but let me try to——

Miss SCHNEIDER. Well, I could make it simple for you. Do you have a ranking system? The answer is yes or no.

Mr. SINDING. The answer to the question do we have a ranking system is yes.

Miss SCHNEIDER. OK.

Mr. SINDING. Does that ranking system correspond precisely with the 65 countries identified by the FAO? No. I am not personally familiar with the FAO report, although I am aware of its existence. I would predict that the priority countries that we have identified are in general——

Miss SCHNEIDER. The same.

Mr. SINDING [continuing]. Those same countries. The methodology that we have used in developing the priorities looks at four factors.

Miss SCHNEIDER. OK.

Mr. SINDING. The first and most important of those is population growth and its relationship to per capita well-being. We look at the demographic situation as being the most important, both population size and the rate of growth.

Miss Schneider. OK.

Mr. Sinding. Second, we also look at the absorptive capacity of the countries concerned. Often the most serious population problem is not one that is immediately susceptible to resolution.

Miss Schneider. Right.

Mr. Sinding. The administrative system and the political will simply aren't there——

Miss Schneider. Understood.

Mr. Sinding [continuing]. To put a lot of money in in a hurry. We try through the extensive use of private and nongovernmental organizations to get services established even before governments are ready themselves to become actively involved, but, as you are aware, that can be a slow process.

Third, we also look at the capacity of the countries to put their own resources into this field. Countries like Mexico and Brazil are able to put a great deal more in than countries like Zaire, Zambia, Ghana, and Liberia. So that the proportion of money that goes into a given country wouldn't necessarily reflect just the demographic situation.

I am blanking on the——

Miss Schneider. The fourth one.

Mr. Sinding [continuing]. Fourth criterion for the moment. I am sorry about that——

Miss Schneider. No problem.

Mr. Sinding [continuing]. But I would be glad to submit it later for the record.

Miss Schneider. Yes; that would be fine.

But I very much appreciate your clear and succinct clarification of your modus operandi because that helps me a lot in just knowing how you operate. But all of those, you know, make an enormous amount of sense.

Mr. Sinding. If I might make one more point on this. We have just completed the 1986 version of our Resource Allocation Plan, which explains in great detail how we are allocating resources both in 1986 and for the 2 years beyond that. And I would be glad to make available to you a copy of that plan for you to examine in detail.

[The material referred to follows:]

U.S. Agency for International Development
Bureau of Science and Technology
Office of Population

RESOURCE ALLOCATION PLAN

December, 1985

revision of
February, 1985
version

Table of Contents

Section	Pages
Introduction	1-2
Policy Development Program (S&T/POP/PDD)	3-12
IEC and Training Program (S&T/POP/IT)	13-24
Family Planning Services Program (S&T/POP/SCCD)	25-31
Contraceptive Technology Development Program (S&T/POP/R)	32-37
Operations Research Program (S&T/POP/R)	38-42

Introduction

Over the past seven years there has been a gradual shift in the allocation of population funds within A.I.D., away from central projects and toward bilateral projects. As the proportional levels of funding available to the S&T Office of Population decline, it becomes increasingly necessary to make hard choices among competing demands for these funds. This Resource Allocation Plan (RAP) outlines the general guidelines to be used in allocating S&T/POP resources over the next two to three years.

It is the consensus of the Population Sector Council that additional population funds are needed. Nevertheless, this paper was written with the assumption that substantial increases in funding for S&T/POP were unlikely in the near future. If significant increases are made to the S&T/POP budget, their allocation would follow the priorities presented in this paper.

The PAP is the result of a nine month analysis and review of the S&T/POP program that was undertaken in recognition of the need to establish a clear rationale for the future allocation of central population funds. It was prepared in close collaboration with the regional bureaus, USAID Missions and our cooperating agencies. It presents S&T/POP's planned allocations of funds in five program areas: policy development; IEC and training; family planning services; contraceptive technology development; and operations research.

Four broad criteria were used in establishing S&T/POP country priorities:

1) Population size and rate of natural increase.

2) A country's ability to use population funds effectively.

3) A country's ability and willingness to commit its own resources to population program activities.

4) The presence or absence of a bilateral population program.

These criteria were not defined and measured in a rigid quantitative way. Rather, they were established and used in a broad, judgmental way by population professionals with many years of experience in managing population assistance programs.

In addition to these four overall criteria, each S&T/POP division used specific criteria related to its discrete program area. While there will be differences of opinion about where an individual country falls in the ranking of a particular functional area, we are confident that the priorities that are established in the sections that follow represent a broad consensus within A.I.D.

Each S&T/POP division, was asked to prepare its own statement. This reflects the fact that no single ranking can be established for a program that is so varied in its composition. For example, the priority countries for the policy function will be quite different from those identified for heavy services support. Thus, while each functional area of the S&T/POP program has a distribution by region and by country, the Office as a whole does not.

Overall, the top priority for S&T/POP is Africa. This is a reflection of the fact that bilateral programs are least well developed and most difficult to get underway in Africa. It is also a consequence of the Agency's strong emphasis on initiating population activities in the African private sector -- an area where S&T/POP, through its multiple cooperating agency resources, has a strong capability.

Asia, which if categorized demographic grounds alone would command the lion's share of funds, will receive a somewhat lower share because of the presence of large bilateral programs in most A.I.D. countries, the relative maturity of its programs, and the willingness of host countries and other donors to finance population programs.

In Latin America and the Caribbean, the absence of a bilateral channel in three key countries (Brazil, Mexico, and Colombia), the region's strategic importance to the United States, the weakness of public programs, and the corresponding requirement of support for private sector activities are all factors that argue for a larger percentage share than demography alone would dictate.

Finally, the share for the Near East reflects its lesser demographic importance; the presence of bilateral support, especially in Egypt; and the relatively primitive state of family planning program development in most countries of the region.

It is important to reiterate that this Office strategy is really a collection of separate functional strategies that were developed with great care and thought by the specialists in each of S&T/POP's functional areas. We have also incorporated comments from our colleagues in AID's regional bureaus and from our cooperating agencies. We believe that it represents the distilled wisdom of a staff that has many years of experience in managing population program assistance. But we do not wish to leave the impression that this is a rigid plan, locked in place for years to come. On the contrary, it is a highly dynamic document, subject to constant revision as circumstances change and as our knowledge of them improves. Thus, this second edition contains several changes in each of the Divisions' proposed allocations.

Policy Development Program

I. PDD's Role in the Policy Development Process

The Policy Development Division (PDD) program contributes to the various stages of population policy development. This includes assistance in gathering data, conducting policy-relevant analyses of the data, presenting policy analyses to decisionmakers in a useable form, and applying analyses to assessments of alternative population policies and programs. This assistance is designed to support the formulation of LDC population policies which help nations in achieving their development objectives. Once policies are formulated, assistance continues through support for implementing effective voluntary family planning programs. Finally, PDD supports evaluations of policies, which, in turn, contribute to adjustments in policies and their implementation. A brief discussion of these types of assistance follows:

> Data Collection is fundamental to the entire policy development process. Production of timely and reliable data through censuses and surveys facilitates preparation of country-specific and policy-relevant research and provides an accurate basis for valid and detailed policy planning and evaluation.
>
> Policy Research provides information on the nature, causes, and consequences of demographic change (particularly fertility and population growth) and the implications of demographic change for population policies and programs.
>
> Research Dissemination ensures that knowledge gained through population research reaches those responsible for development planning and population policies. To be useful to policymakers, policy research findings must be made available in a timely manner and in clear and appropriate formats.
>
> Policy Planning assistance enables policymakers to make effective use of population information and planning allows decisionmakers to carefully consider options for implementing new or improved policies.
>
> Policy Formulation involves defining policies and specific activities for directly or indirectly achieving development objectives. The setting of a policy is an affair internal to a sovereign nation. Specific population policies are not and should not be advocated by A.I.D. The PDD program supports the development of policies by providing objective information and assistance to those responsible for policy formulation.

Policy Implementation involves organizing the financial, human, and institutional resources necessary to achieve policy objectives, including decisions about who will do what, where, when, and how. It also includes choices on the size and emphasis of program efforts.

Policy Evaluation is used to determine if a particular policy is achieving the intended results. Both the direct and indirect effects of specific policy interventions must be considered. Evaluation is a continuing process which draws from additional data collection, research, analysis, and planning work. The result of evaluation is reformation of population policies and adjustment of family planning programs (either through shifts in program orientation or in resource allocation).

II. Criteria for Establishing PDD Country Priorities

Demand for population policy assistance has been increasing in recent years at a rate which outpaces PDD's resources. As a result, PDD must choose where assistance efforts should be focused. Choices are based on a number of criteria which gauge the need for policy work and the appropriateness of AID central resources for meeting needs. These criteria are as follows:

- demographic importance: emphasis given to countries having large populations and growing at high rates;

- level of policy development: emphasis given to countries at early stages of population policy development or which have demonstrable needs at later stages; and

- history of policy activities: emphasis given to countries which have had little assistance in population policy development.

- Agency priorities: emphasis is given to countries which have a high priority for AID. These priorities are developed in collaboration with the State Department.

- existence of bilateral programs: emphasis given to countries not having bilateral programs in population; and

- external policy assistance: emphasis given to countries not currently receiving population policy assistance from other donor agencies.

III. PDD Country and Regional Priorities

Based on the above criteria, AID-assisted countries have been assigned to one of three priority categories: high, medium, and low. These assignments are based on a 1985 assessment. Because a country's status with regard to the various criteria change, these assignments may shift from one year to the next and thus will be reviewed annually. Country priority assignments are presented according to AID geographic region in Table 1.

African countries are dominant in high and medium categories. Apart from the large number of AID-assisted countries in Africa, this is due to the special circumstances of African countries: rapid population growth rates, low level of policy development, short history of policy development assistance, relative absence of bilateral assistance projects, and lack of policy assistance from non-AID sources. The need for policy assistance is equally high in countries of the Near East region; however, many of these countries have bilateral projects and support from non-AID sources and so rank lower than African countries in appropriateness for AID central project funding.

Likewise, countries in the Asia region, despite large populations, tend to rank in the medium to low priority categories, due to more advanced policies, the preponderance of bilateral projects, and availability of policy support through non-AID sources. Countries in the Latin America and Caribbean (LAC) region generally have higher growth rates than Asian countries, but smaller population sizes; policy development in LAC countries is less advanced, but like Asian countries many are supporting policy development work through bilateral and non-AID sources.

V. PDD Resource Allocations

By cross-tabulating PDD country attribution estimates (cumulated over all of PDD's fifteen projects) with priority rankings, an assessment of how well PDD resources are being allocated can be made. Cross-tabulations of attributions for FY 85 and 86 are presented in Tables 2 and 3 with countries grouped by AID geographic region. Resource allocations for FY 85 aggregated across priority categories are as follows:

PRIORITY	TOT EXP. (,000)	PCT.	N	AVG.
High	$ 4,113	29 %	9	$ 457
Medium	6,240	44	30	208
Low	3,717	26	21	177

These statistics show that PDD resources are being allocated to higher priority countries. On average, high priority countries receive approximately twice and three times the support given medium and low priority countries, respectively.

Based on average allocations by priority category, regional allocation goals can be calculated. PDD regional goals and estimated regional resource allocations for FY 85 and 86 (expressed in percent) are as follows:

REGION	PDD GOALS	FY 85 EST.	FY 86 EST.
Africa	50 %	38 %	45 %
Near East	13	9	12
Asia	15	24	17
LAC	22	28	26

This table shows that estimated allocations in FY 85 fall short of PDD goals in Africa and the Near East and exceed PDD goals in Asia and LAC. Estimates for FY 86, however, show regional allocations closely approaching a distribution consistent with PDD goals. Table 4 summarizes country attributions (expressed in percent) for priority and region categories by specific PDD project.)

V. Applications for PDD's Resource Allocation Plan (RAP)

The RAP is used by PDD as a management tool for identifying countries where PDD is allocating excessive resources and those where PDD has not devoted adequate resources. It serves as a useful guide for PDD staff when there are competing demands to begin new activities or expand ongoing activities.

The RAP can further be used to identify those countries where projects may be overconcentrated. In these instances, actions can be taken to consolidate policy support under fewer projects or to increase the coordination of project work.

The RAP serves as an overall guide for PDD's assistance program. Resource allocation decisions for an individual project within the PDD portfolio will consider relative needs for the particular type of assistance provided by the project. These needs will vary from country to country and region to region.

Table 1.
Country Priorities for
Policy Development Division

	REGION			
PRIORITY	AFRICA	NEAR EAST	ASIA	LAC
HIGH	Nigeria Sudan Tanzania * Uganda Zaire	Turkey	Burma	Brazil * Mexico
MEDIUM	Botswana Burkina Faso Burundi Cameroon Chad Ghana Kenya Liberia Malawi Mali Niger Senegal Somalia Zambia Zimbabwe	Algeria Egypt Jordan Morocco Yemen	Bangladesh India Indonesia Pakistan Sri Lanka	Bolivia Ecuador Guatemala Honduras Peru
LOW	Ivory Coast Lesotho Mauritania Rwanda Sierra Leone Swaziland Togo	Tunisia	Nepal Philippines Thailand	Caribbean Colombia Costa Rica Dom Repub El Salvador Haiti Jamaica Panama Paraguay Trinidad/Tob

* Activities are limited or prohibited by congressional restrictions.

Table 2a.*
Country Attributions by Region and Priority Category

REGION Country	PDD TOTALS 1985 ($,000)	 PCT	 1986 ($,000)	 PCT
AFRICA-TOTAL	5,845	37.0%	5,224	43.6%
AFRICA-High	1.784	11.3%	1.729	14.4%
Nigeria	1,024	6.5%	519	4.3%
Sudan	320	2.0%	530	4.4%
Tanzania	20	0.1%	0	0.0%
Uganda	280	1.8%	450	3.6%
Zaire	140	0.9%	230	1.9%
AFRICA-Medium	2,885	18.3%	2,750	22.9%
Botswana	15	0.1%	10	0.1%
Burkina Faso	90	0.6%	115	1.0%
Burundi	50	0.3%	25	0.2%
Cameroon	425	2.7%	180	1.5%
Chad	85	0.5%	60	0.5%
Ghana	100	0.6%	350	2.9%
Kenya	265	1.7%	190	1.6%
Liberia	325	2.1%	55	0.5%
Malawi	100	0.6%	175	1.5%
Mali	410	2.6%	135	1.1%
Niger	135	0.9%	80	0.7%
Senegal	390	2.5%	545	4.5%
Somalia	230	1.5%	570	4.8%
Zambia	0	0.0%	0	0.0%
Zimbabwe	265	1.7%	260	2.2%
AFRICA-Low	660	4.2%	285	2.4%
Ivory Coast	130	0.8%	80	0.7%
Lesotho	0	0.0%	0	0.0%
Mauritania	10	0.1%	75	0.6%
Rwanda	55	0.3%	90	0.8%
Sierra Leone	100	0.6%	40	0.3%
Swaziland	25	0.2%	0	0.0%
Togo	340	2.2%	0	0.0%
AFRICA-Regional	516	3.3%	460	3.8%
ASIA TOTAL	3,730	23.6%	2,040	17.0%
ASIA-High	450	2.8%	230	1.9%
Burma	450	2.8%	230	1.9%
ASIA-Medium	1,335	8.5%	1,345	11.2%
Bangladesh	175	1.1%	130	1.1%
India	230	1.5%	125	1.0%
Indonesia	315	2.0%	435	3.6%
Pakistan	130	0.8%	520	4.3%
Sri Lanka	485	3.1%	135	1.1%
ASIA-Low	1.590	10.1%	295	2.5%
Nepal	675	4.3%	100	0.8%
Philippines	350	2.2%	65	0.5%
Thailand	565	3.6%	130	1.1%
ASIA-Regional	355	2.2%	170	1.4%

Table 2b.
Country Attributions by
Region and Priority Category

REGION Country	PDD TOTALS 1985 ($,000)	PCT	1986 ($,000)	PCT
LAC TOTAL	4,335	27.4%	3,101	25.9%
LAC-High	1,645	10.4%	725	6.0%
Brazil	800	5.1%	435	3.6%
Mexico	845	5.3%	290	2.4%
LAC-Medium	1,235	7.8%	1.281	10.7%
Bolivia	395	2.5%	245	2.0%
Ecuador	175	1.1%	540	4.5%
Guatemala	80	0.5%	166	1.4%
Honduras	65	0.4%	105	0.9%
Peru	520	3.3%	225	1.9%
LAC-Low	1.230	7.8%	995	8.3%
Carribean	0	0.0%	0	0.0%
Colombia	375	2.4%	0	0.0%
Costa Rica	40	0.3%	250	2.1%
Dominican Rep	380	2.4%	155	1.3%
El Salvador	300	1.9%	0	0.0%
Haiti	115	0.7%	55	0.5%
Jamaica	10	0.1%	20	0.2%
Panama	0	0.0%	300	2.5%
Paraguay	10	0.1%	15	0.1%
Trinidad/Tob	0	0.0%	200	1.7%
LAC-Regional	225	1.4%	100	0.8%
NEAR EAST TOTAL	1.392	8.8%	1,369	11.4%
NE-High	230	1.5%	375	3.1%
Turkey	230	1.5%	375	3.1%
NE-Medium	786	5.0%	864	7.2%
Algeria	10	0.1%	120	1.0%
Egypt	391	2.5%	70	0.6%
Jordan	125	0.8%	50	0.4%
Morocco	200	1.3%	519	4.3%
North Yemen	60	0.4%	105	0.9%
NE-Low	230	1.5%	30	0.3%
Tunisia	230	1.5%	30	0.3%
NE-Regional	146	0.9%	100	0.8%
WORLDWIDE	495	3.1%	250	2.1%
GRAND TOTAL	15.797	100.0%	11.984	100.0%

Table 3.
Summary of Country Attributions for
Priority and Region Categories

PRIORITY/ REGION	PDD TOTALS 1985 ($.000)	PCT	1986 ($.000)	PCT
HIGH (AVG)	457	29.2%	340	28.1%
MEDIUM (AVG)	208	44.4%	208	57.2%
LOW (AVG)	177	26.4%	76	14.7%
AFRICA (TOTAL)	5,845	38.2%	5,224	44.5%
ASIA (TOTAL)	3.730	24.4%	2,040	17.4%
LAC (TOTAL)	4.335	28.3%	3,101	26.4%
NE (TOTAL)	1.392	9.1%	1.369	11.7%

Table 4A

Summary of Country Attributions for
Priority and Region Categories

PRIORITY/ REGION	DHS 1985	DHS 1986	DDD/BUCEN 1985	DDD/BUCEN 1986	DDD/WEST 1985	DDD/WEST 1986	DDD/EMPI 1985	DDD/EMPI 1986	PRIORITY/ REGION
HIGH (PCT)	28.3%	17.8%	23.5%	24.2%	44.7%	35.6%	6.3%	7.1%	HIGH (PCT)
MEDIUM (PCT)	36.7%	61.7%	60.1%	60.6%	53.4%	60.1%	63.3%	66.1%	MEDIUM (PCT)
LOW (PCT)	35.0%	20.5%	16.4%	15.2%	1.9%	4.3%	30.4%	26.8%	LOW (PCT)
AFRICA (PCT)	31.7%	43.7%	55.9%	52.9%	54.2%	54.8%	0.0%	0.0%	AFRICA (PCT)
ASIA (PCT)	24.2%	16.4%	14.4%	13.9%	9.2%	8.6%	100.0%	100.0%	ASIA (PCT)
LAC (PCT)	36.7%	30.1%	21.0%	25.7%	28.3%	29.9%	0.0%	0.0%	LAC (PCT)
NE (PCT)	7.5%	9.8%	8.7%	7.5%	8.3%	6.7%	0.0%	0.0%	NE (PCT)

Table 4B

Summary of Country Attributions for
Priority and Region Categories

PRIORITY/ REGION	AWARDS 1985	AWARDS 1986	RESEARCH 1985	RESEARCH 1986	NAS 1985	NAS 1986	IUSSP 1985	IUSSP 1986	PRIORITY/ REGION
HIGH (PCT)	34.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	HIGH (PCT)
MEDIUM (PCT)	32.5%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	MEDIUM (PCT)
LOW (PCT)	33.5%	40.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	LOW (PCT)
AFRICA (PCT)	48.6%	90.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	AFRICA (PCT)
ASIA (PCT)	29.9%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	ASIA (PCT)
LAC (PCT)	21.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	LAC (PCT)
NE (PCT)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	NE (PCT)

Table 4C
Summary of Country Attributions for
Priority and Region Categories

PRIORITY/ REGION	PRB 19	PRB 1986	DISSEMINATION 1985 ($,000)	DISSEMINATION 1986	INPLAN 1985	INPLAN 1986	RAPID II 1985	RAPID II 1986	PRIORITY/ REGION
HIGH (PCT)	0.0%	0.0%	36.7%	35.6%	21.9%	24.7%	40.9%	50.0%	HIGH (PCT)
MEDIUM (PCT)	0.0%	0.0%	54.7%	55.6%	48.5%	60.7%	50.0%	46.7%	MEDIUM (PCT)
LOW (PCT)	0.0%	0.0%	8.6%	8.9%	29.6%	14.7%	9.1%	3.3%	LOW (PCT)
AFRICA (PCT)	0.0%	0.0%	39.7%	39.0%	41.5%	40.3%	54.4%	55.0%	AFRICA (PCT)
ASIA (PCT)	0.0%	0.0%	23.7%	25.0%	34.6%	14.0%	7.4%	10.0%	ASIA (PCT)
LAC (PCT)	0.0%	0.0%	20.5%	20.0%	14.6%	30.0%	29.4%	23.3%	LAC (PCT)
NE (PCT)	0.0%	0.0%	16.1%	16.0%	9.2%	15.7%	8.8%	11.7%	NE (PCT)

Table 4D
Summary of Country Attributions for
Priority and Region Categories

PRIORITY/ REGION	DLPP 1985	DLPP 1986	TECH SUPPORT 1985	TECH SUPPORT 1986	PRIVATE SECTOR 1985	PRIVATE SECTOR 1986	PRIORITY/ REGION
HIGH (PCT)	18.5%	0.0%	0.0%	33.3%	26.3%	31.3%	HIGH (PCT)
MEDIUM (PCT)	63.1%	0.0%	0.0%	60.0%	46.9%	43.8%	MEDIUM (PCT)
LOW (PCT)	18.5%	0.0%	0.0%	6.7%	26.8%	25.0%	LOW (PCT)
AFRICA (PCT)	40.6%	0.0%	0.0%	46.7%	20.1%	18.8%	AFRICA (PCT)
ASIA (PCT)	0.0%	0.0%	0.0%	13.3%	26.8%	25.0%	ASIA (PCT)
LAC (PCT)	40.6%	0.0%	0.0%	20.0%	33.0%	37.5%	LAC (PCT)
NE (PCT)	18.8%	0.0%	0.0%	20.0%	20.[illegible]	18.8%	NE (PCT)

Information, Education, Communication (IEC) and Training Program

I. IEC and Training Objectives

The IEC and Training program (S&T/POP/IT) helps developing countries to improve the quality and availability of family planning IEC and training. Projects within this program assist LDC governments and private organizations to offer safe, culturally acceptable information and training, to enable couples to make informed choices about family planning.

IEC

The information, education and communication (IEC) program addresses the information needs of three groups: couples of reproductive age, program and policy leaders and other population/family planning professionals. It is these groups whose understanding of population and family planning methods and issues most directly affects the success of family planning programs.

The IEC program has two principal objectives:

1. to help public and private family planning programs to plan, carry out and assess activities that inform couples about family planning and that build community acceptance of family planning;
2. to provide up-to-date, comprehensive scientific and technical information to program and policy leaders and to professionals working in population and family planning.

Training

The training program focuses on the categories of workers who design, develop and operate family planning service programs. These workers include: program leaders, administrators, managers and supervisors; physicians; nurses, midwives and auxiliary health personnel; and community and indigenous family planning and health workers. The program also helps newly trained U.S. population professionals obtain overseas working experience to complete their preparation for international careers.

S&T/POP training projects have three major objectives:

1. to meet identified needs for family planning personnel in developing countries;
2. to improve the quality of family planning services offered;
3. to strengthen the family planning training capability of LDC institutions.

II. Criteria for Establishing Priorities

Four criteria determine the ranking of countries in each region:

1. Demographic importance of the country -- including population size and growth rate.

2. Relative need for improvement in the country's current family planning IEC and training programs.

3. Absence of other sources of support for improvements in these areas. A.I.D. bilateral population funding is the principal source considered under this criterion, although some attention was given to the presence of other donors' projects in a country. This priority ranking takes into account the fact that support from division projects is often required in countries with A.I.D. bilateral or other donor population programs, when such programs could benefit from additional IEC or training. In these cases (for example Peru, Sudan, Kenya, Nepal) division projects may provide important complements to the larger bilateral or other donor programs.

4. Interest and capability of the country to use the assistance provided by division projects. Some countries received relatively lower rankings because political or economic considerations preclude a large family planning assistance program, or because there is little receptivity within the government to family planning. Examples of such countries are Ethiopia, Tanzania, Burma and Bolivia. Other countries, such as Sierra Leone and Rwanda, received a relatively higher priority ranking because opportunities for project assistance there are better in terms of both national political/economic circumstances and official receptivity to family planning programs.

One other factor also influences the rankings:

5. The current or potential usefulness of the country as a site for regional training programs. The Division's major training projects [i.e., JHPIEGO And FP Training for Paramedical, Auxiliary and Community Personnel II (PAC II)] support most of the regional training done under S&T/POP/IT auspices. The development of regional training institutions is one emphasis of the PAC II project. While it is clear that host countries for regional training institutions generally benefit from the regional training occuring in the country, the programmatic and fiscal benefits to the region and donor community are equally significant. Country rankings influenced by this factor are indicated by (R) in the country priority listings.

Finally, these priority rankings take into account the various types and levels of IEC and training assistance that are appropriate at different stages in family planning program development. For example, a program that is in the process of formation may need to gain public acceptance of the concept of family planning, and to prepare workers to introduce services. Mature programs, on the other hand, may need assistance to develop fresh communication approaches or to evaluate training programs. Division projects can respond to various program needs on the development continuum.

In all stages of program formation and implementation, however, population, family planning and health professionals need information about scientific and technical developments related to their work. The Population Information Program continues to be an important source for this information.

III. Regional and Country Priorities

The Office of Population divides its IEC and training resources among the four geographic regions as follows:

Africa	35 - 45%
Latin America	25 - 35%
Near East	10 - 20%
Asia	10 - 20%

These rankings are based on the criteria listed in section II.

Listings of country priorities are given below, by region. While there are some differences in geographic priorities among the division projects, there is enough agreement to allow for a combined overall ranking to cover both the IEC and the training programs. It is recognized, however, that if the IEC and the training programs were ranked separately, the priority rankings for each might differ somewhat from the combined ranking.

Countries included in Level 1 (high priority) are those in which IEC and training projects are currently heavily involved and are expected to continue to be heavily involved for the next several years. Countries included in Level 2 (medium priority) include those in which we expect a moderate level of involvement to continue for the next few years. Countries included in Level 3 (low priority) are expected to receive only modest assistance or no assistance from division projects.

Countries that receive bilateral population funds are listed separately from those that do not. At each priority level preference is given to countries that do not have bilateral population programs. Thus project activities in Nigeria, Turkey, Brazil and Mexico will probably receive highest priority overall for the next few years.

A. Africa (35-45% of the total division program)

Countries by Level of Priority	Non-Bilateral	Bilateral
1. High	Nigeria	Ghana Kenya (R) Sudan Zaire
2. Medium	Burkina Faso Burundi Cameroon (R) Chad Lesotho Madagascar Malawi Mali Mauritania Togo Zambia	Liberia Rwanda Senegal (R) Sierra Leone ** Somalia** Uganda* and ** Zimbabwe (R)
3. Low	Benin Botswana Central African Republic Congo Ethiopia* The Gambia Guinea Bissau Ivory Coast (R) Mauritius (R) Mozambique Niger Swaziland Tanzania * (R)	

(R) Indicates country used now for Regional Training or may be so used in near future.

* Assistance may be resumed when conditions and legislation permit.

** Funded through Family Health Initiatives (FHI) Project of the Africa Bureau.

The Africa region is the major focus of IEC and training programs. Needs for assistance are high and other sources of support are often unavailable.

Nigeria receives a significant portion of division resources, both because of its size and because the AID program in Nigeria relies on centrally-funded projects. Funding requirements for IEC and training in Nigeria will most likely exceed the resources currently available.

Zaire, Sudan and Kenya are high priority bilateral countries because of their demographic importance. Training assistance to these countries will continue, and IEC activities are being developed. In addition to its demographic importance, Ghana is a high priority country because of the significant amount of centrally-funded resources required to implement its bilateral project.

Medium priority countries in Africa include small-to-moderate size countries in which ST/POP projects contribute to bilateral projects; or in which there has been some expression of interest by the government, the A.I.D. Mission or the American Embassy.

Low priority countries in Africa are those which have relatively small populations, have pronatalist policies, or have political circumstances that limit AID's involvement.

B. Latin America (25-35% of the total division program)

Countries by Level of Priority	Non-Bilateral	Bilateral
1. High	Brazil Mexico	Peru
2. Medium	Bolivia Colombia (R) Dominican Republic	Ecuador Guatemala Haiti Honduras El Salvador
3. Low	Paraguay	Caribbean Reg'l Costa Rica Jamaica (R) Panama

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(R) Indicates country used now for Regional Training or may be so used in near future.

Brazil and Mexico are expected to continue to receive highest priority in Latin America, since they are large countries with no bilateral programs. Peru falls between high and medium priority. It is assigned high priority at this point because of the Mission's interest in heavy involvement by JHPIEGO, and the likelihood that technical assistance and other IEC support through the Population Communication Services (PCS) project will increase.

Among the countries assigned medium priority, assistance to Colombia is expected to decrease in the next few years. Colombia will probably continue to be a regional training site for JHPIEGO and possibly PAC training. The priority given to assistance to the Dominican Republic could vary -- up or down -- depending on whether country receptivity changes to IEC assistance and to reproductive health training, including laparoscopy. It is expected that the five countries in Level 2 receiving bilateral population assistance (Haiti, Honduras, El Salvador, Ecuador, Guatemala) will continue to both need and request modest amounts of centrally-funded project assistance in IEC and training to provide specialized technical expertise and to support small but important activities not covered under the bilateral agreements.

The countries listed as low priority have serious political constraints to assistance; mature programs and/or relatively low birthrates; or pronatalist policies.

C. Near East (10-20% of the total division program)

Countries by Level of Priority	Non-Bilateral	Bilateral
1. High	Turkey	
2. Medium	Jordan Yemen	Egypt (R) Morocco (R) Tunisia (R)
3. Low	Algeria Cyprus Portugal	

Major training assistance activities for physicians and paramedical workers are ongoing in Turkey and additional activities in both training and IEC are being developed.

(R) Indicates country used now for Regional Training or may be so used in near future.

Moderate assistance to Jordan will continue. Assistance to Tunisia will consist mainly of the regional training center, supported by JHPIEGO; training assistance for paramedical workers, through PAC II; and possibly short-term technical assistance in IEC. Morocco and Egypt will continue to be used as regional training sites. Some IEC and PAC II training assistance may be provided on a moderate scale, especially in Morocco.

D. Asia (10-20% of the total division program)

Countries by Level Priority	Non-Bilateral	Bilateral
1. High	Sri Lanka	Nepal
2. Medium	Burma	India Indonesia (R) Pakistan Philippines (R) Thailand (R)
3. Low	Fiji Malaysia	Bangladesh

While a bilateral population project may be developed in Sri Lanka within the next two years, substantial technical assistance from centrally-funded projects, especially in IEC, may be needed. Nepal is a high priority country because of its continuing needs for specialized assistance in IEC and training which are not covered under the bilateral program.

Six Asian countries are ranked as medium priority. In India, the PCS project provides specialized IEC assistance. India ranks as a high-priority country in the area of IEC although not in the area of training. Pakistan is listed as a medium priority country because of its demographic importance and its need for improvement in current IEC and training programs. It is possible that centrally-funded IEC and training projects may provide assistance to Pakistan in the future, although none does at present. Burma receives only medium priority in

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(R) Indicates country used now for Regional Training or may be so used in near future.

this ranking because of the lack of governmental interest in receiving family planning assistance. It would receive perhaps the highest priority of all Asian countries if the government's attitude became more favorable.

Although the Philippines, Indonesia and Thailand each have relatively advanced country programs and other sources of support, they are ranked as medium priority countries for two reasons. First, the Philippines is an important regional training site. Second, JHPIEGO assistance continues to be important to Indonesia and, to a lesser extent, Thailand. Assistance to the Philippines from PCS, PAC II and JHPIEGO is expected to increase in the coming year.

Bangladesh is assigned low priority primarily because the A.I.D. Mission has felt that other sources of support already fill needs for IEC and training assistance in the country program. If the Mission's position changes, moderate amounts of specialized technical assistance in IEC and paramedical training would be appropriate.

IV. Information and Training Programs: FY 1984 - FY 1987

The following tables show the allocation of division resources over the past two years, and the allocations planned for the next two years.

Data for FY 1984-FY 1987 were taken from the ABS country attribution tables. They show the total amount of S&T/POP/IT project funds obligated (FY84-FY85) or planned (FY86-FY87) for all project activities, including subprojects, technical assistance, subproject development and planning missions, cooperating agency core costs, etc.

FY 84 Obligations by Project for ST/POP/IT*
($000's)

	NFP	JHPIEGO	PAC	PCS	PIP	PSIP	WHTF	REGION TOTAL	REGIONAL PERCENTAGE
AFRICA	263	2,075	2,012	1,200	410	300	330	6,590	37%
LAC	683	1,760	1,001	850	850	100	30	5,274	29%
NEAR EAST	61	1,315	859	175	312	100	0	2,822	16%
ASIA	93	550	1,263	425	728	100	40	3,199	18%
PROJECT TOTAL	1,100	5,700	5,135	2,650	2,300	600	400	17,885	100%

*Table does not include obligations made as buy-ins from regional bureaus or missions.

FY 85 Obligations by Project for ST/POP/IT*
($000's)

	JHPIEGO	MGT. TRAINING	NFP	PAC	PCS	PIP	PSIP	WHTF TOTAL	REGION	REGIONAL PERCENTAGE
AFRICA	3,355	1,222	450	3,702	1,780	957	275	290	12,031	47%
LAC	1,495	874	40	1,910	750	948	75	58	6,150	24%
NEAR EAST	1,245	525	30	1,375	300	330	75	11	3,891	15%
ASIA	505	874	237	813	595	665	75	16	3,780	14%
PROJECT TOTAL	6,600	3,495	757	7,800	3,425	2,900	500	375	25,852	100%

*Table does not include obligations made as buy-ins from regional bureaus or missions.

FY 87 Estimated Obligations by Project for ST/POP/IT*

(\$000's)

	IEC Trng.	JHPIEGO	MGT. TRAINING	PAC	PCS	PIP	PSIP	WWTF	REGION TOTAL	REGIONAL PERCENTAGE
AFRICA	---	2,300	1,200	1,060	1,600	845	400	230	7,635	42%
LAC	---	1,300	625	800	900	1,055	100	20	4,800	27%
NEAR EAST	---	1,205	550	570	240	400	100	20	3,085	17%
ASIA	---	495	625	270	260	700	100	30	2,400	14%
PROJECT TOTAL	000	5,300	3,000	2,700	3,000	3,000	700	300	18,000	100%

*Table does not include obligations projected as buy-ins from regional bureaus or missions.

FY 86 Estimated Obligations by Project for ST/POP/IT*
($000's)

	IEC Trng.	JHPIEGO	MGT. TRAINING	PAC	PCS	PIP	PSIP	WHTF	REGION TOTAL	REGIONAL PERCENTAGE
AFRICA	300	2,120	200	2,555	1,470	1,015	275	300	8,235	46%
LAC	84	1,495	100	1,040	700	1,006	75	10	4,510	25%
NEAR EAST	83	1,180	75	1,040	150	358	75	10	2,971	16%
ASIA	83	505	125	565	230	721	75	30	2,334	13%
PROJECT TOTAL	550	5,300	500	5,200	2,550	3,100	500	350	18,050	100%

*Table does not include obligations projected as buy-ins from regional bureaus or missions.

Family Planning Services Program

I. Family Planning Services Program

The objectives of the Family Planning Services Program (S&T/POP/SCCD) are:

1. to introduce voluntary family planning (FP) services to areas lacking them and to expand FP services where they currently exist.
2. to improve the quality and efficiency of existing FP services in LDCs in both public and private sectors.
3. to make high quality voluntary sterilization services available as an integral part of the LDC health and FP programs.

In order to achieve these objectives, the Services, Commodities, and Coordination Division (SCCD) provides funding and support to the family planning programs primarily in the PVO and profit-making private sector. SCCD presently has cooperative agreements with Family Planning International Assistance (FPIA), the Association for Voluntary Sterilization (AVS), the Pathfinder Fund and most recently with the Center for Development and Population Activities (CEDPA). The new CEDPA project will expand family planning services through the network of women managers throughout the developing world. The division recently added a matching grant with the International Planned Parenthood Federation/Western Hemisphere Region (WHR) which provides services to AID priority countries in Latin America to its portfolio. Additionally, SCCD's Population Technical Assistance Project (ISTI) and a technical assistance agreement with the Center for Disease Control is used to provide consultant services in support of our worldwide program.

More on the for-profit side, SCCD administers a Contraceptive Social Marketing project (SOMARC) which utilizes commercial marketing, promotional and distribution techniques to sell contraceptives at low prices in LDCs; and recently awarded a contract to implement the Enterprise Program, designed to incorporate family planning into private sector channels (e.g. health care delivery programs, employee benefit offerings) and to improve the financial and management skills of family planning PVOs with a view to increasing their coverage and economic efficiency.

The private sector emphasis of the SCCD program does not preclude assistance to LDC public sector programs, especially in non-bilateral countries. The provision of contraceptive supplies and technical assistance to ensure timely availability of contraceptives through bilateral programs and cooperating agency programs continues to be one of the most important functions of our family planning services program.

II. Criteria for Establishing Priorities

The regional goals set by S&T/POP for the utilization of SCCD resources in 1987 are: 35% for Africa, 30% for Latin America and the Caribbean, and 35% for Asia and the Near East. Within each geographic region, SCCD resources are to be distributed according to country priority which is primarily determined by the following three criteria:

a. demographic importance of the country as manifested by large population or a high birth rate.

b. absence of other sources of support for the provision and improvement of FP services such as AID bilateral funding and other donors' support. SCCD support is sometimes required in countries with AID bilateral or other donor population programs when such programs do not include adequate assistance to private sector FP programs.

c. interest and capacity of the country to use family planning assistance. Some countries received relatively low ranking because of lack of receptivity within the government to family planning, or lack of ability to utilize assistance.

The following three factors also influence the ranking:

d. opportunities for private sector involvement;

e. significance of the country to U.S. strategic interest; and

f. economic conditions.

III. SCCD Regional and Country Priorities

Table 1 describes the SCCD Country priority by AID geographic region. Table 2 presents for each country the SCCD Resource Allocation plan from 1983 to 1986. Four cooperating agencies are included in the analysis for 1983 and 1984: FPIA, Pathfinder, AVS, and IPPF. IPPF does not appear in the estimates for 1985 and 1986.

SCCD will provide intensive support to twelve high priority countries to develop and sustain population/family planning activities. Most of these are large non-bilateral countries which rely almost exclusively on S&T/POP resources for program support. A significant additional this year to the list of high priority countries is the Philippines where increased resources from SCCD will be used to stimulate greater private sector involvement in the provision of family planning services. The share of SCCD resources devoted to these high priority countries will increase from 40% to approximately 50% in the period 1983 to 1986. Besides the estimates in Table 2, a matching grant to WHR will be devoted primarily to assisting Mexico, Brazil, and Colombia.

SCCD resources will be provided on a moderate scale to 30 medium priority countries, to provide services and technical assistance; and to create or expand FP organizations, including involvement of influential people in programs.

USAID Missions will be encouraged to plan bilateral assistance to both public and private sector programs so that SCCD can reallocate its funding to be used in other needy areas. The share of SCCD resources devoted to these medium priority countries will decrease from 49% to 41% in the period 1983 to 1986.

In the low priority countries SCCD will begin service delivery programs only when and if its resources have been adequate to provide appropriate assistance to the high and medium priority countries. The share of Division resources devoted to these countries will be reduced from 11% to 9% in the period 1983 to 1986.

IV. Recommend Actions for the Future

SCCD will encourage CAs to conform to the Division goals for regional distribution of resources by 1987.

Table 3 represents the incremental changes SCCD expects to see in the resource allocations of its cooperating agencies over the next three years.

TABLE 1
PRIORITY RANKING OF SCCD COUNTRIES BY REGION

AFRICA	LATIN AMERICA	ASIA/NEAR EAST
High Nigeria Sudan Uganda	High Brazil Colombia Mexico	High India Pakistan Sri Lanka Turkey Philippines
Medium Burkina Faso Cameroon Gambia Ghana Kenya Liberia Madagascar Malawi Mali Rwanda Senegal Sierra Leone Somalia Tanzania Zaire Zambia Zimbabwe	Medium Bolivia Dominican Republic Ecuador El Salvador Guatemala Haiti Honduras Jamaica Peru	Medium Bangladesh Indonesia Morocco Nepal Thailand Tunisia
Low Benin Botswana Burundi Central Afr. Rep. Chad Congo Djibouti Equatorial Guinea Gabon Guinea Guinea Bissau Ivory Coast Lesotho Mauritania Mauritius Mozambique Niger Sao Tome Swaziland Togo	Low Barbados Belize Costa Rica Panama Paraguay Uruguay Venezuela	Low Algeria Burma Egypt Jordan Lebanon Malaysia North Yemen

TABLE 2

SERVICES, COMMODITIES, AND COORDINATION DIVISION
COUNTRY ATTRIBUTION ESTIMATES (FY-84-FY-86)
BY REGION AND PRIORITY LEVEL *

	1984 ($,000)	percent	1985 ($,000)	percent	1986 ($,000)	percent
AFRICA-TOTAL	11527	24.5%	15677	29.5%	14189	32.0%
AFRICA-High	3784	8.0%	6353	12.0%	6166	13.9%
Nigeria	2504	5.3%	3644	6.9%	3269	7.4%
Senegal	227	0.5%	417	0.8%	595	1.3%
Sudan	526	1.1%	1240	2.3%	1302	2.9%
Uganda	528	1.1%	1052	2.0%	1000	2.3%
AFRICA-Medium	6107	13.0%	7478	14.1%	6462	14.6%
Burkina Faso	43	0.1%	289	0.5%	250	0.6%
Cameroon	62	0.1%	106	0.2%	82	0.2%
Gambia	74	0.2%	86	0.2%	74	0.2%
Ghana	820	1.7%	1019	1.9%	906	2.0%
Kenya	1557	3.3%	1264	2.4%	1020	2.3%
Liberia	621	1.3%	819	1.5%	703	1.6%
Malawi	27	0.1%	31	0.1%	27	0.1%
Mali	262	0.6%	344	0.6%	275	0.6%
Rwanda	23	.0%	151	0.3%	332	0.7%
Sierra Leone	260	0.6%	555	1.0%	451	1.0%
Somalia	186	0.4%	311	0.6%	245	0.6%
Tanzania	859	1.8%	1020	1.9%	837	1.9%
Zaire	632	1.3%	701	1.3%	563	1.3%
Zambia	291	0.6%	472	0.9%	429	1.0%
Zimbabwe	390	0.8%	312	0.6%	268	0.6%
AFRICA-Low	1636	3.5%	1846	3.5%	1560	3.5%
Benin	179	0.4%	216	0.4%	168	0.4%
Botswana	78	0.2%	45	0.1%	39	0.1%
Burundi	130	0.3%	170	0.3%	155	0.3%
Cent Afr Rep	0	0.0%	0	0.0%	0	0.0%
Chad	0	0.0%	0	0.0%	0	0.0%
Congo	57	0.1%	84	0.2%	62	0.1%
Djibouti	0	0.0%	0	0.0%	0	0.0%
Equat Guinea	0	0.0%	0	0.0%	0	0.0%
Gabon	0	0.0%	0	0.0%	0	0.0%
Guinea	120	0.3%	93	0.2%	77	0.2%
Guinea Bissau	0	0.0%	0	0.0%	0	0.0%
Ivory Coast	112	0.2%	95	0.2%	81	0.2%
Lesotho	239	0.5%	273	0.5%	242	0.5%
Madagascar	80	0.2%	93	0.2%	80	0.2%
Mauritania	22	.0%	28	0.1%	21	.0%
Mauritius	137	0.3%	191	0.4%	155	0.3%
Niger	0	0.0%	0	0.0%	0	0.0%
Sao Tome	0	0.0%	0	0.0%	0	0.0%
Swaziland	136	0.3%	151	0.3%	146	0.3%
Togo	346	0.7%	408	0.8%	333	0.8%
ASIA TOTAL	11911	25.3%	13985	26.3%	11853	26.7%
ASIA-High	3467	7.4%	4967	9.4%	4759	10.7%
India	1942	4.1%	2552	4.8%	2457	5.5%
Pakistan	905	1.9%	1694	3.2%	1618	3.6%
Sri Lanka	620	1.3%	722	1.4%	685	1.5%
ASIA-Medium	8249	17.5%	8789	16.5%	6793	15.3%
Bangladesh	2327	4.9%	2467	4.6%	1744	3.9%
Indonesia	2504	5.3%	2581	4.9%	1931	4.4%
Nepal	1018	2.2%	1119	2.1%	966	2.2%
Philippines	679	1.4%	1042	2.0%	906	2.0%
Thailand	1720	3.7%	1580	3.0%	1245	2.8%
ASIA-Low	196	0.4%	229	0.4%	301	0.7%
Burma	0	0.0%	0	0.0%	103	0.2%
Malaysia	196	0.4%	229	0.4%	198	0.4%

Table 2 continued

LAC TOTAL	18289	38.8%	18156	34.2%	14203	32.0%
LAC-High	11020	23.4%	11566	21.8%	9421	21.3%
Brazil	4970	10.6%	5217	9.8%	4337	9.8%
Colombia	2763	5.9%	2826	5.3%	2230	5.0%
Mexico	3286	7.0%	3523	6.6%	2854	6.4%
LAC-Medium	6013	12.8%	5497	10.4%	4116	9.3%
Bolivia	643	1.4%	648	1.2%	561	1.3%
Dominican Rep	1015	2.2%	1004	1.9%	709	1.6%
Ecuador	843	1.8%	816	1.5%	597	1.3%
El Salvador	736	1.6%	777	1.5%	510	1.2%
Guatemala	747	1.6%	698	1.3%	556	1.3%
Haiti	183	0.4%	239	0.5%	180	0.4%
Honduras	566	1.2%	554	1.0%	433	1.0%
Jamaica	122	0.3%	140	0.3%	109	0.2%
Peru	1158	2.5%	623	1.2%	460	1.0%
LAC-Low	1256	2.7%	1092	2.1%	666	1.5%
Barbados	127	0.3%	42	0.1%	37	0.1%
Costa Rica	236	0.5%	248	0.5%	213	0.5%
Guyana	50	0.1%	59	0.1%	51	0.1%
Nicaragua	107	0.2%	126	0.2%	108	0.2%
Panama	329	0.7%	245	0.5%	51	0.1%
Paraguay	334	0.7%	286	0.5%	132	0.3%
Uruguay	73	0.2%	86	0.2%	74	0.2%
Venezuela	0	0.0%	0	0.0%	0	0.0%
NEAR EAST TOTAL	5354	11.4%	5292	10.0%	4088	9.2%
NE-High	1373	2.9%	2012	3.8%	1739	3.9%
Turkey	1373	2.9%	2012	3.8%	1739	3.9%
NE-Medium	955	2.0%	1137	2.1%	999	2.3%
Morocco	436	0.9%	513	1.0%	466	1.1%
Tunisia	519	1.1%	623	1.2%	533	1.2%
NE-Low	3026	6.4%	2143	4.0%	1350	3.0%
Algeria	0	0.0%	0	0.0%	0	0.0%
Egypt	2061	4.4%	1250	2.4%	680	1.5%
Jordan	421	0.9%	398	0.7%	224	0.5%
Lebanon	146	0.3%	173	0.3%	148	0.3%
North Yemen	397	0.8%	322	0.6%	297	0.7%
GRAND TOTAL	47088	100.0%	53102	100.0%	44337	100.0%
AVG/PCT HIGH	1786	41.7%	2264	46.9%	2008	49.8%
AVG/PCT MEDIUM	688	45.3%	739	43.1%	593	41.4%
AVG/PCT LOW	175	13.0%	152	10.0%	111	8.7%
AVG/PCT ALL	611	100.0%	690	100.0%	576	100.0%

*The percentage breakdowns for this table were carefully prepared by last year's SCCD Cooperating Agencies. The total money allocations for this table are based on FY-84 actual expenditure and the 10/2/85 S&T/POP Population Planning Account Worksheet figures for FY-85 and FY-86. It is assumed that the new SCCD projects beginning in FY-85, and new A.I.D. priorities (e.g. movement of the Philippines to high priority; halts in funding to Nicaragua and Guyana) will effect the actual FY-85 and FY-86 country resource allocations.

TABLE 3

Services Commodities and Coordination (SCCD)
Regional Allocations for FY-84 through FY-87*

REGION	FY-84 expenditure ($,000)	percent	FY-85 expenditure ($,000)	percent	FY-86 expenditure ($,000)	percent	FY-87 expenditure ($,000)	percent
AFRICA	11,527	24.5	15,675	29.5	14,187	32.0	16,940	35.0
ANE	17,264	36.7	19,275	36.3	15,940	35.9	16,940	35.0
Asia		(25.3)		(26.3)		(26.7)		(25.0)
Near East		(11.4)		(10.0)		(9.2)		(10.0)
LATIN AMERICA	18,289	38.8	18,151	34.2	14,202	32.0	14,520	30.0
TOTAL	47,808	100.0	53,101	100.0	44,337	100.0	48,400	100.0

*The total money allocations for this table are based on FY-84 actual expenditure and the 10/2/85 S&T/POP Population Planning Account Worksheet figures for FY-85 and FY-86 and estimates for FY-87. Percentage breakdowns by region for FY-84 through FY-86 are based on SCCD cooperating agency estimates made in 1984. (FPIA, Pathfinder, AVS and 1984 IPPF estimates are included, while SOMARC, the Enterprise Program and the WHR Matching Grant estimates are not). Percentage breakdowns by region for FY-87 are those proposed by SCCD.

Contraceptive Development Program

Since a major objective is the development of new and improved methods of contraception, a good deal of the research will be carried out in developed countries, particularly the United States. Regarding developing country activities, the criteria for research support include: the quality of the investigators, the general research climate, the demographic and/or political importance, the absence of a bilateral program, and the need for information on pregnancy-related morbidity and mortality. Table I categorizes various countries within each region based upon these criteria.

I. Contraceptive Development Objectives

1. To develop new and improved methods of contraception with emphasis on increasing the variety of methods available so as to maximize individual choice.
2. To assess the efficacy, safety and degree of satisfaction of contraceptive technologies particularly in the context of developing countries.
3. To introduce and adapt contraceptive technologies to varying developing country situations.
4. To strengthen developing country capability to evaluate contraceptive technology.
5. To assess the health impact of various reproductive alternatives in developing country settings.

II. Regional Priorities

These criteria are also the basis for the "ideal" allocation of S&T funding listed below. It is clearly highly influenced by the presence of good researchers and research opportunities in Asia and Latin America. As compared to the February, 1985 RAP this ideal allocation includes a slightly higher percentage of U.S. funding. This reflects a perceived need for more "fundamental" contraceptive research:

Asia	20%
Near East	3%
Latin America	22%
Africa	12%
United States	40%
Other developed countries	3%

The "ideal" allocation includes consideration of U.S.-based core costs, which is a better indicator of overall support. As can be seen from the summary data in Table II, the projected support for 1985, 1986 and 1987 is reasonably close to the "ideal." The 1984 numbers from the MIS which only include in-country subproject costs are somewhat unrepresentative of total support for research which utilizes a high degree of U.S.-based technical assistance and support. More detail is provided in Tables III-VI.

Country Priorities
Contraceptive Development

LATIN AMERICA

High	Medium	Low
Brazil, Colombia, Mexico High demographic/political importance; absence of bilateral program; good quality investigators and research climate.	Jamaica, Haiti, Ecuador, Bolivia High program importance; few good research opportunities.	Belize, Guyana, Paraguay, Uruguay, other Caribbean Relatively low program importance; little or no research opportunities.
Chile Many excellent investigators	Costa Rica, Panama, Argentina, Venezuela Low program importance; good research opportunities.	
Guatemala, Honduras, El Salvador Dominican Rep., Peru Relatively high demographic/political importance; reasonably good investigators, research climate.		

AFRICA

High	Medium	Low
Nigeria, Kenya, Zimbabwe, Zambia, Sudan, Zaire, Mali, Senegal, Liberia High demographic/political importance; some research capability.	Ghana, Ivory, Coast, Cameroon Burkina Faso , Tanzania, Rwanda, Togo Some demographic/ importance; some some research potential.	All others Relatively limited program and research potential.

Country Priorities
Contraceptive Development (continued)

ASIA

High	Medium	Low
India, Indonesia Sri Lanka, Thailand High demographic/political importance; good quality investigators and research climate.	Korea, Malaysia, Taiwan Low program importance; some good investigators.	Burma Limited climate for research.
Philippines, Nepal, Pakistan High demographic and/or political importance. Limited quality of investigators or research climate.	Bangladesh High demographic/political importance. Moderate investigators and research climate. Programmatic absorbtive capacity limited	

NEAR EAST

High	Medium	Low
Egypt High demographic/political importance. Good quality investigators and research climate.	Jordan, Morocco, Tunisia Moderate demographic/political importance; some research capability.	Algeria, Lebanon, Yemen Limited research potential.
Turkey High demographic/political importance. Fairly good investigators and research climate.		

TABLE II

Summary of Actual, Projected and Ideal Regional Funding by Percentage

	Actual	Projected			Ideal
	1984 (MIS*)	1985	1986	1987	
Asia	6.5%	18.3%	17.2%	17.6%	20%
Near East	5.3%	4.6%	3.2%	4.0%	3%
Latin America	14.7%	22.1%	20.6%	21.3%	22%
Africa	5.8%	12.4%	13.1%	13.2%	12%
United States	63.3%	39.3%	42.7%	40.6%	40%
Other Developed	4.4%	3.3%	3.2%	3.3%	3%

*1984 figures include subproject expenses only and do not include project "core costs". 1985 through 1987 includes estimates of central core costs and therefore are more indicative of overall support.

TABLE III

Actual 1984 Support by Region and Project Based on MIS*

	FHI	PARFR	Pop Council	TOTAL
Asia	20.4%	0.6%	0.9%	6.5%
Near East	17.9%	0.0%	0.0%	5.3%
Latin America	25.6%	4.9%	18.6%	14.7%
Africa	19.6%	0.0%	0.0%	5.8%
United States	13.1%	88.5%	77.5%	63.3%
Other Developed	3.4%	6.0%	3.0%	4.4%
TOTAL	100.0%	100.0%	100.0%	100.0%

*includes subproject expenses only

TABLE IV

Projected 1985 Support by Region and Project

	FHI	PARFR	Pop Council	TOTAL
Asia	28.6%	11.7%	5.2%	18.3%
Near East	8.7%	0.9%	0.0%	4.6%
Latin America	26.3%	23.3%	14.6%	22.1%
Africa	19.8%	0.0%	7.3%	12.4%
United States	12.8%	60.4%	70.8%	39.3%
Other Developed	3.8%	3.7%	2.1%	3.3%
TOTAL	100.0%	100.0%	100.0%	100.0%

TABLE V

Projected 1986 Support by Region and Project

	FHI	PARFR	Pop Council	TOTAL
Asia	28.7%	11.2%	5.8%	17.2%
Near East	6.6%	1.0%	0.0%	3.2%
Latin America	25.8%	19.4%	15.0%	20.6%
Africa	22.4%	0.0%	7.5%	13.1%
United States	12.4%	64.6%	70.0%	42.7%
Other Developed	4.1%	3.8%	16.7%	3.2%
TOTAL	100.0%	100.0%	100.0%	100.0%

TABLE VI

Projected 1987 Support by Region and Project

	FHI	PARFR	Pop Council	TOTAL
Asia	26.5%	14.0%	5.7%	17.6%
Near East	7.6%	0.7%	0.0%	4.0%
Latin America	25.0%	24.8%	14.3%	21.3%
Africa	21.4%	0.0%	7.2%	13.2%
United States	14.9%	58.6%	71.4%	40.6%
Other Developed	4.6%	2.9%	1.4%	3.3%
TOTAL	100.0%	100.0%	100.0%	100.0%

OPERATIONS RESEARCH PROGRAM

I. Objectives

The operations research program, Strategies for Improving Service Delivery, is designed to help LDC researchers and program administrators improve the quality and delivery of family planning and maternal-child health services. Using operations research (OR) techniques, more acceptable and more cost-effective approaches to service delivery are empirically tested and evaluated. This program seeks to increase the capability of host country professionals to use operations research as a management tool to diagnose and solve service delivery problems.

II. Regional Priorities

The operations research program supports a series of country-specific, regional, interregional and technical umbrella projects aimed at improving family planning service delivery throughout the developing world. U.S. institutions currently under contract with A.I.D. to provide technical and financial assistance in family planning operations research are: Columbia University, Johns Hopkins University, Tulane University, University of Michigan, University Research Corporation, the Population Council, the National Academy of Sciences and the International Federation for Family Life Promotion. The distribution of OR program resources by region is summarized in Table 1.

Table 1. Fiscal Year Obligations under the Operations Research Program, by Region and Percentage

	Obligations (in percent)					
	Actual	Projected			Avg.	Ideal
Region	FY 84	FY 85	FY 86	FY 87		
Africa	48	57	49	45	50	50
Asia	16	15	18	20	17	20
Latin America and the Caribbean	31	24	26	30	28	25
Near East	5	4	7	5	5	5
TOTAL	100	100	100	100	100	100
(in thousands)	($7,400)	($5,800)	($7,400)	($8,000)		

On average over the FY84-FY86 period, 50 percent of OR program obligations will be spent in Africa, 28 percent in Latin America and the Caribbean, 17 percent in Asia and five percent in the Near East. The fluctuations in percentages for Asia and the LAC region do not represent major changes in program emphasis but reflect varying obligation schedules. A new OR umbrella project for Latin America, began in FY84, and a new Asia OR project began in FY 85.

III. Regional Strategies

The general strategies to be used over the next several years in implementing family planning operations research activities in each region are outlined below:

In Africa, the primary concerns are availability, quality and accessibility of family planning services. Community-based distribution programs offering family planning and other basic health services will be emphasized. Demonstration projects of CBD programs will therefore be appropriate. Studies which focus on increasing the efficiency of clinic services will also be included. Training programs for service providers and outreach workers will be designed and evaluated. Several natural family planning projects are currently being implemented in Africa; the use and cost-effectiveness of NFP will be the focus of new operations research studies planned for the region.

In Latin America, the countries of Colombia, Brazil and Mexico are a high priority for operations research because of their demographic and political importance and because they do not have bilateral population assistance. Service delivery costs in these countries will be given extra consideration. Technical assistance will be a major emphasis in countries throughout the region. There are many skilled researchers in Latin America who, with technical assistance and funds, can conduct high-quality operations research. The private sector, which includes the family planning associations and the commercial sector, is crucial to the delivery of contraceptive services and supplies. Accordingly, the private sector will be a high priority in Latin America and the Caribbean for operations research.

In the Near East region, expanded operations research activities are needed. In Egypt, operations research should focus on the private sector as well as help diagnose why the national family planning program has not been more successful. In Morocco, the OR program will be helpful with the expansion of the VDMS project to identify weaknesses in family planning service delivery and to test corrective actions. As the family planning effort increases in Yemen, Jordan and Algeria, the operations research program will be used to understand how specific service delivery strategies function. Operations research may play an important role in Turkey where no bilateral population programs exists.

Many of the family planning programs in Asia are well established. They have adequate physical and training facilities. The primary emphasis in Asia, therefore, will be on the management, supervision and long-term financing of programs. The important issue is how to improve the quality and cost-effectiveness of the programs rather than improving access to services. In Nepal, Pakistan and Bangladesh, the family planning programs are less mature and the operations research efforts will be directed at improving the delivery systems.

IV. Country and Research Priorities

A. Selection Criteria

The criteria for establishing country priorities for operations research program assistance are outlined below:

High: Includes countries which have:

- high demographic and/or political importance
- no A.I.D. bilateral program or low bilateral population assistance per capita
- high government receptivity/commitment to family planning
- high level of interest in and capability to use operations research assistance
- excellent potential for operations research activities to have an important policy and/or programmatic impact

Medium: Includes countries which have:

1)
- medium to high demographic and/or political importance
- medium A.I.D. bilateral population assistance per capita
- high government receptivity/commitment to family planning
- moderate level of interest in and capability to use operations research assistance
- good potential for operations research activities to have an important policy and/or programmatic impact

2)
- medium demographic and/or political importance
- no A.I.D. bilateral program or low bilateral population assistance per capita
- moderate government receptivity/commitment to family planning
- moderate level of interest in and capability to use operations research assistance
- good potential for operations research activities to have an important policy and/or programmatic impact

Low: Includes countries which are currently not targetted for centrally funded assistance under the operations research program for demographic, political and/or economic considerations.

Within the high and medium priority countries, operations research studies are classified according to three types:

A: Diagnostic or demonstration projects focusing on improving the availability, quality and accessibility of FP/MCH services; OR projects will cover service delivery costs where needed.

B: Diagnostic/demonstration projects or operations research on service delivery components; OR projects will generally cover delivery costs.

C: Operations research on service delivery components, particularly issues of supervision, management, financing schemes and cost-effectiveness; OR projects will not cover service delivery costs.

NATURAL FAMILY PLANNING PROJECT

A new five-year natural family planning project was awarded to Georgetown University in late FY 85 at a level of $2.3 million for the first year. The project is designed to improve knowledge, availability, acceptability and effectiveness of NFP services (including breastfeeding as a method of birthspacing) in developing countries. This represents approximately one third of the Agency's support for NFP. The projected distribution of support by regions is:

Latin America:	40%
Africa	40%
Asia	15%
Near East	5%

Table 2: Country and Research Priorities by Region and Fiscal Year

FY 84 - 87

Priorities	AFRICA	ASIA	LATIN AMERICA & THE CARIBBEAN	NEAR EAST
High	Burkina Faso (A) Nigeria (A) Senegal (A) Somalia (A) Sudan (A) Zaire (A) Zimbabwe (B)	Bangladesh (B) India (B) Indonesia (C) Pakistan (B) Sri Lanka (C)	Brazil (B/C) Colombia (C) Dom. Rep. (B/C) Mexico (B/C)	Morocco (B) Tunisia (B/C) Turkey (B) Yemen (A)
Medium	Botswana (A) Burundi (A) Cameroon (A) Chad Congo (A) Gambia (A) Ghana (A) Ivory Coast (A) Kenya (A) Lesotho (A) Liberia (A) Madagascar (A) Malawi (A) Mali (A) Mauritania (A) Mauritius (A) Niger (A) Rwanda (A) Sierra Leone (A) Swaziland (A) Tanzania (A) Togo (A) Uganda (A) Zambia (A)	Burma (A) Nepal (A) Philippines (B) Thailand (C)	Antigua (B) Barbados (B) Belize (B) Bolivia (A) Costa Rica (C) Dominica (B) Ecuador (B) El Salvador (B) Grenada (B) Guatemala (B) Haiti (B) Honduras (B) Jamaica (B) Panama (B/C) Peru (A/B) St. Kitts (B) St. Lucia (B) St. Vincent (B)	Algeria (A) Egypt (B) Jordan (A)
Low	Benin CAR Comoros Djibouti Eq. Guinea Ethiopia Gabon Guinea Guinea Bissau Sao Tome South Africa	Malaysia	Argentina Chile Guyana Nicaragua Paraguay Trinidad Uruguay Venezuela	Lebanon

Miss SCHNEIDER. That would be terrific. And seeing as how this particular agency having jurisdiction over a broad spectrum agencies always runs into the frustration of information transfer and cooperation, I think it would be terrific if you had the access to the FAO's report. Because we don't want to be funding two agencies to be doing essentially the same thing.

Another question that I wanted to touch on had to do with the study—reading all of these studies here, a lot of exciting evenings I have been having——

[Laughter.]

Miss SCHNEIDER. The USAID Office of Women in Development put together a recent report entitled "Women of the World," and it emphasized that adequate information on the situation of women is a critical step in the development of realistic national policies, plans, and programs for the women's participation in some of these economic development projects. We are all in agreement on the problem. We are in agreement philosophically on the solution. I would like to see some specifics as to your particular agency addressing some of the needs that the chairman had earlier raised, and that is focusing on how we can get more women involved in the training process.

Now, all of you have, as I have said before, articulated the challenges there, the societal and otherwise. But having been in Africa with about 10,000 other women and having had the opportunity at the U.N. Conference on Women to meet with many of the African villagers, but also women leaders, the thing that kept coming back to me was that we would like the United States to assist us in policy directives in bringing about greater opportunities for women.

Now, it seems to me that you don't even have to think women, you only have to think people, when you look at agriculture in Africa. If you were to do a study of agriculture in Africa, you will see that 60 percent to 80 percent of all agriculture is being performed by women. But yet, when you look at the managers, the staff directors, et cetera, they are done by men. Well, it is easy to say that the level of literacy is higher for men and that is why they are being put in those positions, but you don't have to be terribly literate to learn irrigation processes or to be well versed in reforestation.

And I think the best example is being done by Prof. Wengari Mathye, who I personally know, from Nairobi, Kenya. She is the chairman of the National Council of Women in Kenya, but she is also a very innovative leader of the Reforestation project in Kenya.

Mr. SCHEUER. Will my colleague yield on this point?

Miss SCHNEIDER. Yes.

Mr. SCHEUER. Yes. Just to quote Mr. Sinding's testimony, the last paragraph on page 9: "Non-literate villagers can be trained to deliver family planning and basic health services as well as to keep basic, simple records."

So it indicates that in a whole variety of areas——

Miss SCHNEIDER. It is possible.

Mr. SCHEUER [continuing]. It is absolutely possible if the will is there.

Miss **Schneider**. So what is our will? How can AID address the agricultural technological advancements of reforestation, focus on water supply, on agriculture, or whatever, when the primary people involved in these projects are women? What can we do?

Mr. **Edelman**. I think we have to do more directly working with women. I mentioned earlier on the extension workers we have only begun training, I believe it is in Nigeria, a project training women extension agents to go out, and the response was just what you thought. It was terrific. And we are only beginning to do that. And we are not doing—in my view we are not doing enough focusing on that particular problem. Clearly women can best address women. That seems to be true. In population programs that seems to be more—the one I really visited was the one in Zimbabwe where you had women going out into the—not into the villages, into the rural areas because I went with one woman 1 day out into the rural areas. And so it was a woman who was explaining in that case the pill, is what she was distributing to women and explaining that clearly you can't have a man doing that. And it is a matter of training women how to do that, and I think we should do more.

As I mentioned, we are trying to direct our participant training programs to get more women involved in them. And my own bias is that when in doubt between a man and a woman for a training project I will take the woman, just to try and give that the push.

I have tried to bring more women into the bureau into senior level management even to try and get more of that into the push. And I think I have probably the best record in the agency of—and it has been a very conscious——

Miss **Schneider**. Terrific.

Mr. **Edelman** [continuing]. Decision on my part to do that, but it is all for the same reason. I think more of it isn't so much of setting down strict policies as it is to keep hammering away at it. I did—at a mission directors conference I had last year, I raised that as a specific concern of mine, and I continue to hammer away at it.

Miss **Schneider**. That is most commendable. Do you have some numbers that—I would really like to see the numbers of women who are involved in the projects both on the African staff level and also yours at AID because I think that your efforts individually are extremely commendable, and those are the kinds of things that I like to hold up at different speeches I give and say this is what Mr. Edelman is doing in his agency. There is no reason why it can't be done elsewhere. And I think that that kind of sort of progressive and responsible effort really needs to get more attention. So I would be delighted if you have some specific figures that you can share with me. I would be real excited to be your PR person——

Mr. **Edelman**. Great.

Miss **Schneider** [continuing]. In that regard.

Mr. **Edelman**. Terrific. Let me see what we can pull together for you on that. I know it is pretty easy to do on staff members. Let's see what we have to—what we know about projects and other kinds of data. Not only to pull it together for you, but I think pull it together for me. I haven't seen it.

Miss **Schneider**. All right. Well, that is something that I think is necessary and I think—to keep an ongoing assessment of the number of women involved. And the AID Office of Women in Development has put together phenomenal statistics as to the situation of the status of women in development, and I think that that is the tool that we have already spent the money on. That when you go in to meet with the government leaders or the PVOS, or whomever, that this is the tool that says, look, we've got 80 percent of the people working in the fields are women and we want to assure that, you know, this percentage or the overwhelming percentage of people involved in the training program are reflected by this.

So I would encourage you to use all of the numbers. The same comments have been reported by OTA, the Office of Technology Assessment. We have got more studies than we know what to do with. I think it is time we, you know, move beyond the studies and say, all right, the overwhelming evidence is to move in the direction of securing more economic development opportunities for women. And that will help solve some of the budget needs of the Population Office and other needs, so we would be doing the right thing.

And I commend you for your efforts and look forward to working with you to help address some of these challenges.

Mr. EDELMAN. Mr. Chairman, if I may just ask a question for clarification. Should I submit that for the record to the Committee, or should I just submit that straight to the Congresswoman?

Mr. SCHEUER. No, submit it to us, and it will be part of the record.

Mr. EDELMAN. Fine. Fine.

Mr. SCHEUER. OK?

[The information follows:]

Insert - page 93
Mr. Edelman's Testimony
October 31, 1985

WOMEN IN A.I.D. PROGRAMS IN AFRICA

Below is a breakdown of African participants funded for training in the United States in FY 1984 and FY 1985. These figures include both long and short term training in academic as well as technical fields. Some of this training was funded under bilateral projects under African field missions and some was funded from various regional projects. We do not have a further breakdown currently available to reflect agriculturally related training versus other types of training.

Africa Participants Trained in the U.S.

Year	Male	Female	Total
FY 1984	2,802	695	3,497
FY 1985	2,794	713	3,507

Also, three tables attached profile women in senior executive positions in A.I.D. The first of these tables compares the number of men versus women in the three geographic bureaus, both in A.I.D. Washington and overseas. The following two tables note men versus women by position titles, for the Africa Bureau only. One table covers A.I.D. Washington positions; the other covers overseas positions in USAID African missions.

PROFILE OF WOMEN IN THE A.I.D. WORKFORCE

EXECUTIVE-LEVEL PERSONNEL	AFRICA	ASIA/NEAR EAST	LATIN AMERICA
AID/WASHINGTON - TOTALS	{19} {100.0%}	{16} {100.0%}	{15} {100.0%}
MEN	15 { 79.0%}	13 { 81.2%}	14 { 93.3%}
WOMEN	4 { 21.0%}	3 { 18.8%}	1 { 6.7%}
OVERSEAS - TOTALS	{48} {100.0%}	{36} {100.0%}	{32} {100.0%}
MEN	42 { 87.5%}	34 { 94.4%}	29 { 90.6%}
WOMEN	6 { 12.5%}	2 { 5.6%}	3 { 9.4%}

AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR AFRICA
BREAKDOWN OF EXECUTIVE ASSIGNMENTS AID/W & OVERSEAS
BY POSITION TITLES AND SEX GROUP DESIGNATIONS
AS OF September 30, 1985

Position Titles	ALL APPOINTEES		
	Total	Men	Women
Overall:	66 (100.0%)	55 (83.3%)	11 (16.7%)
(AID/W)			
Assistant Administrator	01	01	--
Deputy Asst. Administrator	03	02	01
Associate Asst. Administrator	01	--	01
Office Director	08	07	01
Deputy Office Director	05	04	01
Staff Director	01	01	--
Total	19 (100.0%)	15 (79.0%)	04 (21.0%)

AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR AFRICA
BREAKDOWN OF EXECUTIVE ASSIGNMENTS AID/W & OVERSEAS
BY POSITION TITLES AND SEX GROUP DESIGNATIONS
AS OF September 30, 1985

Position Titles	ALL APPOINTEES Total	 Men	 Women
(Overseas):			
Mission Director	18	15	03
Deputy Mission Director	12	10	02
AID Affairs	04	03	01
AID Representative	10	10	--
Director, Regional Development Offices	02	02	--
Deputy Director, Regional Deputy Offices	02	02	--
Total Overseas:	48 (100.0%)	42 (87.5%)	06 (12.5%)

Mr. **Scheuer**. Let me ask one last question. When you decide where you are going to concentrate your funds and your resources and your programs, and you are going to pick six or eight countries out of 45 sub-Saharan African countries, what are the criteria by which you are going to make that selection?

Mr. **Edelman**. You are speaking here now for agricultural research. This was in the plan, where we are speaking of technology generation. There are several criteria.

First of all, an existing institution. That something already exists. It is faster and cheaper and more productive to build on what exists than to start from scratch to begin with. The attitudes of the government. The level of training already existing within the country itself. Are there already master's degrees, or people with master's degrees, people with Ph.D.'s? A lot of it has to do with the base. What is the attitude in the government towards these kinds of things? Does it also exist?

What is the size of the country? You can't, if the country is too small, it would be very difficult to draw the critical resources together in terms of manpower or in resources to do it. And what has been the track record? How serious is the government about doing things? Have they been serious or are they not serious? Also, where are they located? Because we are trying to get a diversity for this technology generation, a diversity spread throughout the Continent in different places and so that everything isn't all congregated in one place.

And then we have also, to be honest, looked at political factors. For example, Uganda would be a prime candidate. It has had a superb university in Makerer University there that had excellent facilities. Practically today, given the instability in Uganda, it is just not practical for us to try and do anything long range in Uganda given the instability that is going on there. So we reluctantly had to eliminate Uganda from the list, although 5 years ago, or a few years ago it would have been a wonderful candidate there for the ability to operate and really the stability and having some expectation if we are certain of something now, 10, 20 years from now we can build on it and we will still be able to do it.

Those were the major, I think those were the major criteria that we were using.

Mr. **Scheuer**. Now you have heard a lot of discussion this morning about our concerns about the environment, concerns that are included in Congressman Ben Gilman's legislation. You have heard our concerns about opportunities for women and improving the role and status of women through assuring that they have places in training programs and that they begin to be involved in the design and the operation of all of these programs. You have heard about our concern for family planning as an essential element in development programs, including agricultural development programs.

Would it be your intent to include among your criteria the extent to which each of these countries—in planning your agricultural research projects—is sensitive to our environment concerns, concerns about enhancing the status and role of women through including them to a far higher extent in training programs and so forth, to the extent that that country is willing and able to give leadership to including more women in their family planning programs? Would these three criteria that you have heard a great deal about this morning be included in this bundle of criteria that you are going to use to select the countries and then to evaluate their progress on an ongoing basis?

Mr. EDELMAN. Let me say on a couple of things in a broad sense there is probably, given the relativity in Africa, a coincidence. That is, the countries where we will probably be focusing for the other reasons you said are also the most open of the societies in Africa, and because they are most open they give the greater opportunities and the greater considerations of the things that you have talked about.

Mr. SCHEUER. No, but I am asking you specifically as to whether you will use your ability to do a little jawboning and persuading and a little arm-twisting. When you are going to provide substantial funds in these six or eight countries, will you encourage them to make progress in these three areas and to include concerns for these three areas in the programs that they and you develop together?

Mr. EDELMAN. Yes, on the matter of using that as jawboning. We jawbone every place in Africa that we can on all of those concerns.

Mr. SCHEUER. Very good.

All right, look, we are way behind. That is a testament to how interesting and thoughtful we found your testimony.

Mr. EDELMAN. May I make one last statement to you?

Mr. SCHEUER. Of course.

Mr. EDELMAN. Especially since she is going to be the next witness. About the Peace Corps and AID, just let me make my comment about AID/Peace Corps cooperation. And I attribute the fact that AID/Peace Corps cooperation has probably never been better in the history of either organization. I attribute that completely and totally to Peter McPherson, a former Peace Corps volunteer, and Loret Ruppe's cooperation.

In the field there is marvelous cooperation throughout Africa, at least. And I am only speaking of Africa, between the AID and the Peace Corps. They have terrific—are tremendously helpful to us in carrying out our AID activities. I am an enthusiastic fan of the new Peace Corps Africa Food Systems Initiative, which I think goes right at some of the concerns that you all are talking about, and even in Mr. Gilman's bill it is right on target. We have cooperated and worked together even in developing that, and I just wanted to show my enthusiasm I think.

And in the field you can see it, too. That AID and Peace Corps work so well together now compared to what it used to be, and that is because of the attitudes and the changes in attitudes of Mr. McPherson and Mrs. Ruppe. I just wanted to say that while she was here and since she is coming up next.

Mr. SCHEUER. Well, thank you very much to all three of you. We have enjoyed your testimony. We have been impressed by you. We have asked you some tough questions, and you have responded very forthrightly and very intelligently. We appreciate your coming here and we are very grateful to you. Thank you very much.

Mr. EDELMAN. Thank you, Mr. Chairman.

Mr. **Scheuer**. All right. Now we will invite Loret Miller Ruppe, Director of the Peace Corps, to come to the witness table.

Congressman Paul Henry, one of our ablest and most caring and contributing members. I would like Congressman Henry to introduce you properly, Mrs. Ruppe.

Mr. **Henry**. Well, thank you, Mr. Chairman. I am embarrassed by your generosity.

Let me just add a word of personal welcome. I have had the privilege of knowing Phil Ruppe and Loret for any number of years, but particularly in recent years working with Mrs. Ruppe the tremendous job she has done of reinvigorating I think the spirit of inspiration, the idealism in the Peace Corps during her brief years there. I think we all are aware that there was a period in which the Peace Corps became a base for domestic purposes needlessly politicized, and I really have to commend you for the outstanding job you have done of getting us past that period to the point where I think it enjoys a breadth of support such as it has never enjoyed before and also with the disciplines, I have to say as an earlier volunteer, Mr. Chairman, and then I will get into my questioning, but I speak as one of the people who went during the first years of the Peace Corps, and it remains one of the most phenomenal experiences enriching, and I think most of the people that have gone always come back feeling they have gained more than they have given, and I think that is a very common observation. In the earlier years, it was almost sometimes as if the idealism exceeded our understanding of what we really had to do. I mean, if there had been several years of fine-tuning with the people going are much more appropriately trained and targeted to specific and more clearly defined role missions. It has been hard I think to get there and you have done that extremely well.

Mrs. **Ruppe**. With a lot of help.

Mr. **Henry**. And I wanted to commend you and all your help.

Mrs. **Ruppe**. Thank you very much.

Mr. Chairman, could I also invite up a few of our team, who are working primarily in Africa?

I would like to introduce Martin Mueller, who is our regional director for Africa, Mr. John Zarofonetis, who is our coordinator for African Food Systems Initiative, and George Mahaffey, who works in our Forestry Department. He has been a key leader.

Mr. **Scheuer**. Good. Let me inform you, as I have before the other witnesses, your full testimony will be printed at this point in the record. So we would urge you not to read your testimony but simply to chat with us informally for 6 or 8 minutes. Then I am sure we will have some questions for you.

STATEMENT OF LORET MILLER RUPPE, DIRECTOR, PEACE CORPS, ACCOMPANIED BY MARTIN MUELLER, AFRICA REGIONAL DIRECTOR; GEORGE MAHAFFEY, FORESTRY SECTOR SPECIALIST; JOHN ZAROFONETIS, COORDINATOR, AFRICA FOOD SYSTEMS INITIATIVE

Mrs. **Ruppe**. Thank you very much, Mr. Chairman.

Members of the subcommittee, thank you very much for providing Peace Corps during its 25th anniversary with a forum of this importance to tell of the contributions that 50,000 Peace Corps volunteers who have served in Africa during the past 25 years, what their contribution has been towards the sustained development of this vast continent—25 years ago, the first Peace Corps volunteers entered this region. From the first, Peace Corps chose a long-term approach to address Africa's needs. Our first programs tended to focus on education in the classroom—math, science, history—but many volunteers even in the early days worked in agriculture, introduced better methods, for irrigation systems, wells, forestry, and other infrastructure projects.

It was interesting that Life magazine focused on going back 18 years ago to Niger and found wells that volunteers had dug and helped villagers promote at that point in time still working with green gardens now growing around them, showing a tremendous impact at the village level.

Today, of the more than 6,000 volunteers that we have working worldwide, over half of them serve in 25 sub-Saharan nations, and half of those volunteers are involved in agriculture, food production and rural development projects. These volunteers are helping the small-scale farmers, who are mostly women. You can easily say it is the African farmer and her husband when you are dealing with agriculture on that continent. And in general, these volunteers transfer the basic skills necessary to improve the quality of life.

Peace Corps is sensitive to the role of women, has been a leader of this in the African economy, and in our programs we constantly stress the importance of finding appropriate training for this overlooked group. This is one of the challenges of the 1980's, how indeed you bring women in and give them the training that is needed to produce more food to bring income generation to the village level.

We also have many volunteers who worked in separate village cooperatives teaching money management, bettering co-op structures for use in small-scale business enterprise. We have volunteers who serve as designers and supervisors of water projects. We are into renewable energy, including building safe, energy-conserving stoves; charcoal production, and solar food drying—all technologies that can be used and need to be used and need to be brought to the villages, to the African farmer.

In addition to their primary projects, almost all of our volunteers are involved in secondary projects, many of them which revolve around small garden production, nutrition.

So throughout the years of Peace Corps programming, we see our emphasis has changed from the classroom teaching to a priority of combating hunger by improving agricultural production and addressing the overall, fitting into the overall 5-year development plans of the countries we are in. Using techniques adapted to particular constraints of rainfall, soil conditions, water availability and seed quality, volunteers working with villagers are able to transfer appropriate technology at the grassroots level. A typical example that I have seen would be in Burkina Faso where a volunteer, a 23-year-old from one of the western states, took me to his village and said, "You know the villagers came to me a year or so ago and said, could I bring them in bulldozers, did I have earth-moving equipment," and I said, "well, no, I am a Peace Corps volunteer. But indeed if you are willing to really work on this I can show you a way." He encouraged them to put low, 2- or 3-foot-high rows of rocks across the floodplain, encouraged them to plant vegetation and trees, and indeed 1 year later the first rains had come and you could see that they had been held back by these rows of rocks and indeed vegetation was growing and that village was going to be saved from desertification. Again, showing that small is beautiful, this is the type of work that needs to be done.

My written statement contains more examples of our volunteer successes. We know that Peace Corps volunteers introducing animal traction in Togo have tripled the land under production by the small farmer. We know that a World Bank report recently showed that Peace Corps working in forestry has done four times the amount of planting working with the Public Law 480 program than any other group.

So these are the types of examples that we show, and we would like to do more of it.

Dr. Norman Dorlag, winner of the Nobel Peace Prize, for his work on the green revolution, and just recently during World Food Day honored by President Reagan with a Presidential award, has stated that the nuts and bolts are lying around but nobody puts them together. They have got quite a lot of unassembled data for Africa on varieties of hybrids that have been tested in many places, on the use of diseases and the use of moisture. The most difficult battle against famine has more to do with psychology and politics than with horticulture. I am very pleased to be in front of a committee that recognizes that and is trying to put those nuts and bolts together to create the strategies that need to be addressed in long-range planning and coordination that indeed will allow a green revolution in Africa led by Africans in partnership with interested leaders from the industrialized nations.

The Peace Corps knows there are no easy solutions, but it has always believed that the solutions must lie in long-term grassroots programs. Coordination is a key to putting the nuts and bolts together. Coordination between U.S. and international aid donors is critical. We must make the most of all available resources. Peace Corps volunteers have long coordinated with private voluntary agencies in the field, and new collaborative arrangements with the PVO's, USAID, USDA, the Forestry Service and other agencies are bringing us closer to the day when worldwide hunger is eradicated.

In another area, the World Bank has concluded that the major problem in improving agricultural production is to develop a more effective use of existing research capacity. Research results have not been adequately disseminated. Researchers are isolated from farmer and extension workers. Peace Corps volunteers with their language skills, with their willingness to live in the villages of the developing world are a key link to bringing the drought-resistant sorghum, higher yield millet seed, appropriate technology to the farmer, the traditional small holder, and to bring to women farmers the training and technology so needed.

The African food systems, which is our responsibility, our response to allowing our volunteers to be more effective, for Peace Corps to be a more effective part of promoting food production in

Africa, will place teams of from 5 to 10 technically trained volunteers in a specific region within a country to work with small-scale farmers on the problems of food production. This includes all aspects of production from preproduction, land preparation, water supply to postproduction, storage, preservation, processing, marketing and nutrition education.

As our long statement talks about, the four countries have been selected. I must reemphasize that this program is designed to use basic technologies and food production skills that have already been proven effective throughout the region.

The challenge presented by the African food crisis, as we all know, is unprecedented. There are no easy solutions. Everybody has said that who has testified here before your committee. The solution will lie only in intensive, long-term international effort. Africans themselves are responding to that challenge. All they ask is help in doing those things that need to be done. Peace Corps volunteers with their skills, knowledge, and leadership are in a unique position to provide the technical assistance needed at the village level to provide a vital contribution in response to this challenge. High-level research provides the technological breakthroughs. Only at the village level where technology must fuse with social, cultural, and economic realities will the final battle against hunger be won and the goal of sustainable development begins.

Peace Corps, at 25, at the right place, at the right time, will be proud to continue making a difference.

Thank you.

[The prepared statement of Mrs. Ruppe follows:]

PEACE CORPS

STATEMENT

OF

LORET MILLER RUPPE

DIRECTOR

THE PEACE CORPS

BEFORE

THE HOUSE SCIENCE AND TECHNOLOGY

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH

AND ENVIRONMENT

OCTOBER 31, 1985

806 Connecticut Ave., N.W. Washington, D.C. 20526

MR. CHAIRMAN, MEMBERS OF THE SUBCOMMITTEE: THANK YOU FOR PROVIDING ME WITH THE OPPORTUNITY TO APPEAR BEFORE YOU TO TELL YOU ABOUT THE CONTRIBUTIONS THE PEACE CORPS VOLUNTEERS ARE MAKING TOWARDS ALLEVIATING HUNGER IN AFRICA, AND ABOUT OUR NEWEST PROGRAM DESIGNED TO MAKE AN EVEN GREATER CONTRIBUTION TOWARDS SUSTAINED DEVELOPMENT IN THAT REGION. BEFORE I DETAIL OUR CURRENT PROGRAMS AND NEW INITIATIVE I WILL GIVE YOU A BRIEF HISTORY OF OUR EXPERIENCES IN AFRICA. TWENTY-FIVE YEARS AGO PEACE CORPS VOLUNTEERS ENTERED THIS REGION TO PROVIDE THE TECHNICAL EXPERTISE NEEDED TO ADDRESS THE PROBLEMS OF ILLITERACY AND HUMAN SUFFERING AT THE GRASS ROOTS LEVEL. ALTHOUGH EARLY PEACE CORPS EMPHASIS WAS ON EDUCATION, OUR VOLUNTEERS ALSO PATIENTLY INTRODUCED BETTER AGRICULTURE METHODS, WATER-SANITATION SYSTEMS, FORESTRY, RURAL PUBLIC HEALTH AND INFRASTRUCTURE PROJECTS TO RURAL FARMERS AND VILLAGERS ACROSS AFRICA.

MANY OF THE HOST COUNTRY PEOPLE BEGAN TO SEE THAT PEACE CORPS VOLUNTEERS COULD OFFER PRACTICAL SKILLS AND SIMPLE BUT EFFECTIVE TECHNOLOGIES THAT WOULD LEAD TO A BETTER WAY OF LIFE FOR THEMSELVES AND THEIR CHILDREN. THERE HAVE BEEN MANY SUCCESSFUL PROJECTS THROUGHOUT THESE 25 YEARS. OVER 50,000 PEACE CORPS VOLUNTEERS HAVE SERVED IN 32 COUNTRIES ACROSS AFRICA SHARING THEIR KNOWLEDGE AND SKILLS WITH LITERALLY MILLIONS OF PEOPLE.

THE FIRST GROUPS OF VOLUNTEERS RETURNING TO THE UNITED STATES HAD A PROFOUND IMPACT ON PEACE CORPS PROGRAMS AS WELL. THEY WERE FILLED WITH KNOWLEDGE AND EXPERIENCE THAT, IN THE EARLY 1960'S, WAS A RARITY--FIRST HAND, GRASS ROOTS EXPERIENCE. PEACE CORPS PUT RETURNED VOLUNTEERS BACK TO WORK AS ADVISORS, TRAINERS, PROGRAMMERS, AND STAFF MANAGERS. PEACE CORPS' PROJECTS BECAME MORE EFFECTIVELY PROGRAMED, GEARED TO THE GOALS AND OBJECTIVES OF THE HOST GOVERNMENTS. AS WE LEARNED MORE ABOUT THE NEEDS OF THE AFRICAN FOOD PRODUCERS, WE LEARNED TO TARGET THE RIGHT KIND OF PROJECTS TOWARDS THOSE WHO COULD MAKE THE DIFFERENCE--THE SMALL FARMERS, MOST OF WHOM ARE WOMEN.

PEACE CORPS IN AFRICA: CURRENT PROGRAMS

PRESENTLY, PEACE CORPS HAS 6,000 VOLUNTEERS WORKING IN OVER 60 NATIONS AROUND THE WORLD. OF THESE, MORE THAN 2,700 ARE SERVING IN 25 AFRICAN NATIONS. IN THE PAST FEW YEARS, PEACE CORPS HAS FOCUSED ITS EFFORTS IN THIS REGION ON PUTTING THE VOLUNTEER IN THE ROLL OF AN EXTENSION AGENT. AREAS OF EMPHASIS INCLUDE: BASIC TECHNOLOGY FOR IMPROVED FOOD PRODUCTION IN THE HOST COUNTRIES; HEALTH AND NUTRITION EXTENSION PROJECTS; AND SMALL-SCALE PRIVATE SECTOR DEVELOPMENT.

THROUGHOUT THE YEARS PEACE CORPS PROGRAMING EMPHASIS HAS CHANGED FROM CLASSROOM TEACHING TO A PRIORITY OF COMBATING HUNGER BY IMPROVED AGRICULTURE PRODUCTION. VOLUNTEERS USING TECHNIQUES ADAPTED TO THE PARTICULAR CONSTRAINTS OF RAINFALL, SOIL CONDITIONS, WATER AVAILABILITY, AND SEED QUALITY WORK WITH VILLAGERS AND SUCCESSFULLY TRANSFER THEIR EXPERTISE AT THE GRASS ROOTS LEVEL.

HERE ARE SOME SUCCESSES WE HAVE SEEN:

THE PEOPLE OF A SMALL VILLAGE IN BURKINA FASO CAME TO THEIR PEACE CORPS VOLUNTEER AND ASKED HIM TO HELP THEM STOP THE DESERT FROM ENGULFING THEIR LAND. SENSING THEY EXPECTED SOME KIND OF MASSIVE TECHNOLOGICAL ASSISTANCE, THE VOLUNTEER REPLIED THAT HE COULDN NOT BRING IN TRACTORS AND OTHER EARTH MOVING EQUIPMENT, BUT IF THEY TRULY WANTED TO STOP THE DESERT, HE WOULD SHOW THEM MODEST TECHNIQUES APPROPRIATE TO THEIR KNOWLEDGE AND RESOURCES. TOGETHER THEY BUILT A SERIES OF LOW ROWS OF ROCKS ALONG THE FLOOD PLAIN AND PLANTED TREES AND VEGETATION. I VISITED THAT VILLAGE LAST YEAR, JUST A SHORT TIME AFTER THEY HAD BEGUN. I SAW THAT THE RAINS HAD SWEPT ACROSS THE ONCE BARREN FIELD BUT THAT THIS TIME THE TOPSOIL HAD BEEN TRAPPED BY THE ROCKS, AND THE TREES AND VEGETATION WERE TAKING HOLD.

ANOTHER VOLUNTEER IN NIGER WORKED WITH VILLAGERS TO BUILD WINDBREAKS AND PLANT TREES AND GRASSES TO STABILIZE A 200 FOOT, TWO MILE LONG SAND DUNE, AND TURNED IT INTO A PRODUCTIVE RANGE LAND, ALL IN THE COURSE OF THE VOLUNTEER'S TWO YEAR ASSIGNMENT.

IN TOGO, PEACE CORPS VOLUNTEERS ARE TEACHING ANIMAL TRACTION TO RURAL FARMERS. BY USING LOAD BEARING ANIMALS THE LOCAL FARMERS DOUBLE AND SOMETIMES TRIPLE THE SIZE OF THEIR CULTIVATED LAND, THUS INCREASING FOOD PRODUCTION. THIS PROJECT CONSIDERED TO BE A "MODEL" PROGRAM IS BEING DUPLICATED THROUGHOUT OTHER THIRD WORLD COUNTRIES.

IN BOTSWANA, WHERE THE CURRENT DROUGHT HAS DEVASTATED CROPS, ONE PEACE CORPS VOLUNTEER, WORKING WITH HOST COUNTRY NATIONS, HAS CONSTRUCTED 50 DAMS WHICH BENEFIT 65 VILLAGES. THIS PROJECT NOT ONLY BROUGHT POTABLE WATER TO THOUSANDS OF PEOPLE, BUT IT CREATED 2,100 JOBS FOR AREA RESIDENTS.

IN GAMBIA, A PEACE CORPS VOLUNTEER HAS SPENT THE LAST YEAR ADVANCING THE IDEA OF TREE PLANTING. FROM A 1/2 ACRE OF LAND HE AND HIS HOST COUNTRY COUNTERPARTS HAVE RAISED OVER 2,500 TREES. THIS FORESTRY ACTIVITY CAUGHT THE INTEREST OF A LOCAL SCHOOL TEACHER WHO INTERESTED HIS STUDENTS IN STARTING A GARDEN/ORCHARD PROJECT. THIS GROUP HAS NOW PLANTED 1,000 MANGO TREES.

IN A VILLAGE IN SENEGAL ONE VOLUNTEER WORKING WITH A WOMEN'S COOP HAS INTRODUCED A WOOD LOT/GARDEN PROJECT WHICH IS FLOURISHING WITH THE HELP OF A NEWLY DUG WELL AND WATER IRRIGATION SYSTEM. A NEWLY PURCHASED MILLET GRINDER HAS ALSO BEEN INSTALLED IN A BUILDING THE VILLAGERS HELPED TO BUILD. THIS NEW GRINDER WILL SHORTEN MEALTIME PREPARATION FROM 6 TO 2 HOURS AND WILL PROVIDE VILLAGE INCOME AND BENEFIT APPROXIMATELY 600 OTHER WOMEN FROM SURROUNDING VILLAGES.

THE CUMULATIVE EFFECT OF THESE INDIVIDUAL EFFORTS, MULTIPLIED BY THE THOUSANDS OF VOLUNTEERS WHO HAVE SERVED IN AFRICA, HAVE TRULY MADE A SIGNIFICANT IMPACT ON THE DAILY TORMENT OF ILLITERACY, DISEASE, AND FAMINE.

MORE GENERALLY, VOLUNTEERS ARE WORKING WITH FARMERS ACROSS AFRICA TO HARNESS LOCAL WATER RESOURCES THROUGH IRRIGATION, TO INTRODUCE CROP ROTATION, AND FERTILIZATION TECHNIQUES, ALL TO IMPROVE AGRICULTURAL YIELDS. STILL OTHERS ENCOURAGE THE BUILDING OF FISH PONDS TO AUGMENT AVAILABLE PROTEIN SOURCES AND CREATE INCOME AND THE PLANTING OF WOOD LOTS TO PROVIDE NUTRITION FRUITS, AND MUCH NEEDED WOOD SOURCES.

HEALTH, NUTRITION AND PROVIDING POTABLE WATER ARE ALSO IMPORTANT COMPONENTS IN BUILDING A SUSTAINABLE DEVELOPMENT SYSTEM. HERE, TOO, VOLUNTEERS ARE MAKING A DIFFERENCE.

FOR EXAMPLE, IN ZAIRE LAST YEAR, VOLUNTEERS IN PUBLIC HEALTH AND NUTRITION VACCINATED 6,000 CHILDREN, TRAINED 30 PRIMARY SCHOOL TEACHERS IN HEALTH SUBJECTS, AND PROVIDED PRENATAL CARE AND TRAINING FOR 4,000 WOMEN. IN KENYA, VOLUNTEERS ARE WORKING AT THE COMMUNITY LEVEL TO ASSIST IN THE DEVELOPMENT OF POTABLE WATER SUPPLIES FOR RURAL AREAS. ALSO IN KENYA IN A TWO-YEAR PERIOD, VOLUNTEERS IN ONE REGION ASSISTED 10 COMMUNITIES IN COMPLETING MAJOR WATER PROJECTS, INITIATED THREE COMMUNITY-BASED WELL DEVELOPMENT PROJECTS, DEVELOPED TWO COMMUNITY-BASED RAIN CATCHMENT PROJECTS, AND ASSISTED WITH THE DESIGN AND CONSTRUCTION OF SEVERAL SMALLER IMPROVED WATER SOURCES AND LATRINES.

PEACE CORPS AND WOMEN IN DEVELOPMENT

PEACE CORPS HAS LONG RECOGNIZED THAT THE WOMEN OF AFRICA MAKE A STAGGERING CONTRIBUTION TOWARDS THE FOOD PRODUCTION AND ECONOMY OF AFRICAN COUNTRIES. IN OUR PROGRAMS WE CONSTANTLY STRESS THE IMPORTANCE OF PROVIDING APPROPRIATE TRAINING TO THIS OVER LOOKED GROUP. WOMEN DO UP TO 80 PERCENT OF THE AGRICULTURAL WORK IN SUB-SAHARAN AFRICA, IN ADDITION TO PREPARING THE MEALS, COLLECTING FIREWOOD AND WATER, SELLING THEIR PRODUCE IN THE MARKETS AND PROVIDE THE CARE FOR THEIR CHILDREN. WOMEN HAVE BEEN FOUND AS INNOVATIVE AS MEN IN ADAPTING NEW TECHNOLOGIES, AND YET ONLY RECEIVE A FRACTION OF SERVICES TRADITIONALLY AVAILABLE TO "THE FOOD PRODUCERS." INDEED THE PHRASE "THE AFRICAN FARMER AND HER HUSBAND" IS VERY APT HERE.

PEACE CORPS SOUGHT THE REASONS FOR THIS SITUATION. WE HAVE FOUND THAT MANY AFRICAN WOMEN ARE SIMPLY TOO BUSY OR ARE EXCLUDED FROM COMMUNITY MEETINGS WHERE NEW IDEAS ARE DISCUSSED. THE FEW AGRICULTURAL EXTENSION AGENTS THERE ARE, ARE MEN AND THEY RARELY CONSULT WITH FEMALE FARM MANAGERS WITHOUT A MALE MEMBER OF THE FAMILY PRESENT. BECAUSE WOMEN RARELY CONTROL THE MONEY, THEY ARE NOT TARGETED FOR INNOVATIONS REQUIRING CAPITAL. WOMEN OFTEN ARE GIVEN EDUCATION IN HOME ECONOMICS OR HANDICRAFT PROJECTS RATHER THAN AGRICULTURE.

CURRENTLY, HUNDREDS OF PEACE CORPS PROJECTS ARE BEING DIRECTED AT HELPING WOMEN--FROM PEACE CORPS VOLUNTEERS HELPING WOMEN'S COOPS TO OBTAIN LOANS AND CREDIT FOR AGRICULTURE TO PEACE CORPS VOLUNTEERS TRAINING WOMEN IN THE MAINTENANCE OF FISH PONDS AND FISH MARKETING, AND WORKING WITH WOMEN IN RICE PRODUCTION, WEEDING, HARVESTING, PROCESSING, AND STORAGE.

AFRICA FOOD SYSTEMS INITIATIVE

TWENTY-FIVE YEARS OF COMMUNITY LEVEL DEVELOPMENT EFFORTS IN AFRICA PROVIDE PEACE CORPS WITH A PROVEN METHODOLOGY, A STRONG REPUTATION AND CONSIDERABLE PROGRAMING INSIGHTS. WITH THIS BACKGROUND PEACE CORPS HAS BEGUN A NEW PROGRAM THAT IS TARGETED TO THE AFRICAN FOOD PRODUCERS, THE SMALL SCALE FARMER. THIS PROGRAM CALLED THE AFRICA FOOD SYSTEMS INITIATIVE IS LONG-TERM, GRASS ROOTS, AND GEOGRAPHICALLY CONCENTRATED. UNDER THIS INITIATIVE PEACE CORPS' ROLE IS TO ASSIST LOCAL INSTITUTIONS AND COMMUNITIES DEVELOP, ADAPT AND IMPLEMENT BASIC TECHNOLOGIES DESIGNED TO OVERCOME FOOD SYSTEM OBSTACLES. KEY OBJECTIVES INCLUDE NOT ONLY THE DEVELOPMENT OF SELF-SUSTAINING FOOD SYSTEMS, BUT ALSO THE UPGRADING OF LOCAL CAPACITY, BOTH PUBLIC AND PRIVATE, TO CONTINUE THE DEVELOPMENT PROCESS.

THE AFRICA FOOD SYSTEMS INITIATIVE, AN INNOVATIVE PROGRAM FOR PEACE CORPS, WILL PLACE FIVE TO TEN TECHNICALLY SKILLED VOLUNTEERS AS A TEAM IN SPECIFIC REGIONS BEGINNING THIS FISCAL YEAR IN FOUR AFRICAN COUNTRIES WITH PLANS TO EXPAND UP TO TEN NATIONS BY 1990. THIS TEAM APPROACH WILL ADDRESS THE INTERRELATED PROBLEMS OF THE AGRICULTURAL SYSTEM. VOLUNTEERS WITH DIFFERENT SKILLS AND/OR WITH DIFFERENT LEVELS OF SIMILAR SKILLS WORK TOGETHER TO MEET TARGET OBJECTIVES. TEAMS MAY WORK ON PROBLEMS FROM PRE-PRODUCTION (INCLUDING LAND PREPARATION AND WATER SUPPLY), THROUGH PRODUCTION TO POST-PRODUCTION (INCLUDING STORAGE AND PRESERVATION, PROCESSING, MARKETING AND NUTRITION EDUCATION). THE SPECIFIC SKILL MIX REPRESENTED IN A GIVEN TEAM, AT A GIVEN TIME, IS DETERMINED BY AN ONGOING PROCESS OF ASSESSING EVOLVING NEEDS AND OPPORTUNITIES. THE KEY CONCEPT HERE, AS DIFFERENT FROM PREVIOUS VOLUNTEER PLACEMENTS, IS THAT PEACE CORPS VOLUNTEER ASSIGNMENTS WILL BE CAREFULLY COORDINATED SO THAT THE "TEAM" OF VOLUNTEERS IS WORKING IN A COMPLEMENTARY WAY.

THE AFRICA FOOD PROGRAM DESIGN INCLUDES THE FOLLOWING:

- TECHNOLOGIES THAT CAN BE ADAPTED TO THE NEEDS EXPRESSED BY, AND THE MEANS AVAILABLE TO THE LOW-RESOURCE FARMER AND COMPATIBLE WITHIN THE LOCAL SOCIAL AND CONTEXT;
- MINIMAL COSTS TO PARTICIPATING GOVERNMENT AND COMMUNITY GROUPS;
- TRAINING AND EXTENSION ACTIVITIES DEVELOPED WITH REALISTIC EXPECTATIONS REGARDING THEIR CONTINUATION FOLLOWING THE DEPARTURE OF VOLUNTEERS;
- A LONG-TERM, TARGETED COMMITMENT TO SPECIFIC GEOGRAPHICAL AREAS TO ASSURE SUSTAINABILITY; AND
- ACTIVITIES INTEGRATED INTO THE STRATEGIES OF HOST COUNTRY INSTITUTIONS, PUBLIC AND PRIVATE, AS WELL AS OTHER DONOR EFFORTS.

PEACE CORPS HAS IDENTIFIED FOUR COUNTRIES TO BEGIN OUR PILOT AFRICA FOOD PROGRAM, MALI, ZAIRE, LESOTHO, AND NIGER. IN EACH COUNTRY IDENTIFIED FOR PROJECTS, PROGRAM DEVELOPMENT BEGINS WITH A THOROUGH ASSESSMENT OF EXISTING FOOD SYSTEMS IN ORDER TO IDENTIFY MAJOR MICRO-LEVEL CONSTRAINTS ON INCREASED FOOD AVAILABILITY. THESE ARE THEN RELATED TO THE BROADER MACRO-LEVEL CONTEXT. PEACE CORPS, WHILE FOCUSING AT THE VILLAGE LEVEL, THUS ALSO PARTICIPATES IN AN ONGOING POLICY DIALOGUE WITH HOST GOVERNMENT OFFICIALS, UNDERSCORING THE RELATIONSHIP BETWEEN NATIONAL POLICIES AND THE RESPONSIVENESS OF THE PRODUCTION AND DISTRIBUTION SYSTEMS.

IN MALI, THE INITIATIVE TARGETS THREE SEPARATE AGRICULTURAL ZONES--RAINFED, IRRIGATED AND MIXED. IN ALL THREE, VOLUNTEERS WILL WORK WITH FARMER GROUPS TO UPGRADE THEIR CAPACITY TO RESPOND TO NEW INCENTIVES AND A RANGE OF TECHNICAL PACKAGES. WORKING WITH FARMERS WHO ARE WOMEN WILL BE A MAJOR EMPHASIS.

IN THE RAINFED AREA, VOLUNTEERS WILL BE INTEGRATED INTO A MAJOR USAID AGRICULTURAL DEVELOPMENT EFFORT, AND WILL INITIALLY CONCENTRATE ON THE EFFECTIVENESS OF FARMERS' ASSOCIATIONS. IN THE MIXED RAINFED/IRRIGATED AREA AROUND SEGOU, VOLUNTEERS WILL COOPERATE WITH A PROJECT PRINCIPALLY FUNDED BY THE EUROPEAN ECONOMIC COMMUNITY. THEY WILL EMPHASIZE DRY SEASON VEGETABLE PRODUCTION, AGRO-FORESTRY AND SIMPLE IRRIGATION. IN THE SEMI-DESERT CONDITIONS AROUND TIMBUKTU, ONLY IRRIGATION PROVIDES HOPE FOR INCREASED FOOD SECURITY. VOLUNTEERS WILL WORK ON THE DEVELOPMENT OF SMALL-SCALE IRRIGATION ACTIVITIES, INCLUDING SEVERAL INITIALLY BEGUN BY USAID AND NOW CONTINUING UNDER AFRICARE. APPROXIMATELY 35 VOLUNTEERS WILL BE SENT TO MALI IN 1986, WITH PROGRAM EXPANSION OF UP TO 75 VOLUNTEERS BY 1988. (THESE ARE IN ADDITION TO OUR CURRENT ONGOING PROGRAMS.)

IN ZAIRE, THE SIZE AND DIVERSITY OF THE NATION'S AGRICULTURE COMBINED WITH THE ABSENCE OF BASIC INFRASTRUCTURE (ROADS, MARKETS, AGRICULTURAL RESEARCH, EXTENSION AND CREDIT FACILITIES, ETC.), MAKE IT ONE OF THE MOST CHALLENGING OF ALL AFRICAN COUNTRIES. AT THE SAME TIME, ZAIRE'S UNTAPPED AGRICULTURAL POTENTIAL IS ENORMOUS. NOT ONLY DOES IT HAVE THE CAPACITY TO FEED ITS OWN PEOPLE ONCE AGAIN, BUT IT COULD ALSO PROVIDE CONSIDERABLE FOOD EXPORTS TO ITS NEIGHBORS. PEACE CORPS' ZAIRE AFRICA FOOD PROJECTS ARE INITIALLY BASED IN THREE

REGIONS--BANDUNDU, KIVU, AND KASAI, WITH EXPANSION TO SHABA SLATED FOR 1987. THE FIRST TEAMS OF VOLUNTEERS WILL CONCENTRATE ON SOIL DEVELOPMENT AND INTRODUCTION OF NEW PLANT MATERIALS, IMPROVEMENT OF ANIMAL HUSBANDRY TECHNIQUES, WATER DEVELOPMENT, AND NUTRITION EDUCATION. UP TO 75 NEW VOLUNTEERS WILL BE SENT TO ZAIRE DURING 1986, WITH AN EQUAL NUMBER FOLLOWING IN 1987 AND 1988. THE ASSESSMENT AND DESIGN PHASES OF OUR AFRICA FOOD ACTIVITIES IN LESOTHO AND NIGER ARE NOW TAKING PLACE. THOUGH WIDELY SEPARATED GEOGRAPHICALLY AND IN THE NATURE OF THEIR FOOD SYSTEMS, BOTH HAVE IDENTIFIED WATER DEVELOPMENT AS A CRITICAL STARTING POINT FOR INCREASED FOOD OUTPUT. IN NIGER, VOLUNTEERS WILL ALSO WORK ON THE DEVELOPMENT OF DRY SEASON AGRICULTURAL ACTIVITIES USING SMALL-SCALE IRRIGATION. IN LESOTHO, VOLUNTEERS WILL FOCUS ON MARKETING QUESTIONS RELATED TO VEGETABLE PRODUCTION, AND BE INTEGRATED INTO A MAJOR USAID FUNDED AGRICULTURAL PROJECT. VOLUNTEER NUMBERS FOR EACH OF THESE COUNTRIES WILL BE DETERMINED DURING THE ASSESSMENT AND DESIGN PROCESS.

ACCORDING TO PRESENT PLANS UP TO 150 PEACE CORPS VOLUNTEERS WILL BE RECRUITED FOR THE PILOT PROGRAMS BY THE END OF FISCAL YEAR 1986.

VOLUNTEER ROLES

BEGINNING WITH THE ACTIVITIES LISTED ABOVE, THE INITIATIVE WILL GO ON TO PROGRESSIVELY ADDRESS OTHER CONSTRAINTS ON THE INDIVIDUAL FOOD SYSTEMS. NEW ACTIVITIES WILL DEVELOP BASED ON AN ONGOING SYSTEM OF MONITORING AND EVALUATION. THOUGH IT IS NOT POSSIBLE TO PREDICT EXACTLY WHAT THESE NEW ROLES WILL ENTAIL, OR WHAT THE SPECIFIC SKILL MIX WILL BE AT ANY ONE TIME, PEACE CORPS' EXPERIENCE INDICATES THE FOLLOWING AS LIKELY ASSIGNMENT UNDER THE INITIATIVE:

ACTIVITIES RELATING TO INCREASED/IMPROVED AGRICULTURAL INPUTS:

1. SMALL-SCALE IRRIGATION SYSTEMS USING WELLS, SPRING CAPPING, WATER CATCHMENT SYSTEMS AND/OR IMPROVED WATER CONTROL IN SWAMPS. IMPROVED PUMP AND SMALL-SCALE IRRIGATION SYSTEM MAINTENANCE IN AREAS WHERE THESE EXIST;

2. IMPROVED MECHANICAL POWER THROUGH ANIMAL TRACTION;

3. IMPROVED SEED MULTIPLICATION AND STORAGE OF PLANTING MATERIAL BOTH ON AND OFF FARM;

4. PRODUCTION OF LOCAL FERTILIZERS; GREEN MANURE CROPS SUITABLE TO THE LOCAL AREA; MULCHING MATERIALS; ALLEY CROPPING; AND IMPROVED COMPOSTING METHODS;

5. BLACKSMITHING AND LOCAL MANUFACTURE OR REPAIR OF AGRICULTURE TOOLS, IMPLEMENTS AND ANIMAL DRAWN MACHINERY. BUSINESS DEVELOPMENT FOR SMALL-SCALE INPUT RETAILERS;

6. INTEGRATED PEST MANAGEMENT STRESSING ALTERNATIVES TO CHEMICAL PESTICIDES AND, AS APPROPRIATE, THE SAFE USE OF CHEMICALS; AND

7. AGRO-FORESTRY (MIXED CROPPING SYSTEMS, TREE CROPS, DUNE STABLILIZATION, WINDBREAKS, ALLEY CROPPING, ETC.).

ACTIVITIES RELATING TO FOOD PRODUCTION:

1. IN COORDINATION WITH NATIONAL AND REGIONAL EFFORTS, THE INTRODUCTION OF IMPROVED VARIETIES OF EXISTING MAJOR FOOD CROPS (PARTICULARLY MAIZE, RICE, SORGHUM, MILLET, COWPEAS, ETC.) AND/OR THE INTRODUCTION OF IMPROVED

AND APPROPRIATE CULTURAL PRACTICES (GROUND PREPARATION, SPACING, MIXED CROPPING, TIMING OF OPERATIONS, ETC.).

2. SMALL ANIMAL HUSBANDRY (POULTRY, RABBITS, PIGS, GOATS AND SHEEP). FISH CULTURE. THE IMPROVED INTEGRATION OF ANIMAL HUSBANDRY INTO CROP PRODUCTION SYSTEMS. AGRO-FORESTRY, NURSERY DEVELOPMENT. TREE PLANTING FOR FIREWOOD.

3. VEGETABLE PRODUCTION, HOME GARDENING--BOTH RURAL AND URBAN. BEEKEEPING, AND OTHER DRY SEASON INCOME-GENERATING ACTIVITIES.

COLLABORATION IN THE FIELD

I HAVE DISCUSSED THE IMPORTANCE OF COLLABORATION RELATIVE TO THE AFRICA FOOD INITIATIVE. IF PEACE CORPS HAS DISCOVERED NOTHING ELSE IN THE PAST 25 YEARS, IT IS THAT PERMANENT CHANGE IS ALMOST ALWAYS THE RESULT OF COOPERATION, RATHER THAN ANY SINGULAR EFFORT. SINCE I ASSUMED THE DIRECTORSHIP OF PEACE CORPS IN 1981, THE AGENCY HAS BEEN MAKING A DEDICATED AND SOLID COMMITMENT TO COORDINATION, COOPERATION AND LONG-RANGE PLANNING.

COORDINATION WITH THE HOST COUNTRY NATIONS HAS ALWAYS BEEN A PREREQUISITE FOR OUR PROGRAM. VOLUNTEERS HAVE ALWAYS BEEN SENT OVERSEAS SPECIFICALLY AT THE REQUEST OF HOST GOVERNMENTS. ONCE IN COUNTRY, VOLUNTEERS OFTEN WORK WITH PRIVATE VOLUNTARY ORGANIZATIONS, SUCH AS CARE, CATHOLIC RELIEF SERVICES, AFRICARE, CROSSROADS AFRICA, EXPERIMENT IN INTERNATIONAL LIVING, AND SAVE THE CHILDREN. TODAY, 1985 FINDS US REACHING OUT TO MAXIMIZE OUR LIMITED RESOURCES, WITH OVER 250 ONGOING PROJECTS WITH PRIVATE VOLUNTARY ORGANIZATIONS WORLD-WIDE.

SUBSTANTIAL COORDINATION, PARTICULARLY WITH OTHER U.S. GOVERNMENT ENTITIES, HAS ALSO INTENSIFIED IN JUST THE PAST FIVE YEARS. PEACE CORPS AND USAID HAVE STRIVED TO DEVELOP PROGRAMS OVERSEAS WHICH BLEND AND BENEFIT FROM THE UNIQUE RESOURCES OF EACH ORGANIZATION.

ONE SUCCESSFUL PRODUCT OF THIS PARTNERSHIP IS THE SMALL PROJECTS ASSISTANCE PROGRAM ESTABLISHED IN 1983. USAID PROVIDES UP TO $40,000 PER COUNTRY PER YEAR FOR PEACE CORPS COMMUNITY LEVEL PROJECTS DEALING IN FOOD PRODUCTION, WATER RESOURCES, INCOME GENERATION, RENEWABLE ENERGY, AND SMALL BUSINESS DEVELOPMENT. TO DATE, MANY VITAL GRASS ROOTS PROJECTS HAVE BEEN FUNDED AND PROVED SUCCESSFUL.

SMALL PROJECT ASSISTANCE FUNDS (SPA) HAVE HELPED OUR VOLUNTEERS AND THEIR VILLAGERS TO BUILD WATER CATCHMENT SYSTEMS FOR CLEAN WATER. THESE FUNDS HAVE ALSO HELPED TO BUY MILLET GRINDING MACHINES THAT REDUCE WOMEN'S FOOD PREPARATION TIME FROM SIX TO TWO HOURS PER DAY. A VILLAGE IN THE GAMBIA THAT SUPPLIES MEAT TO VILLAGES IN THE SURROUNDING COUNTRY SIDE USED SPA FUNDS TO BUILD A SANITARY SLAUGHTERHOUSE, RATHER THAN EXPOSING BUTCHERED MEAT TO INSECTS AND DIRT IN THE OPEN FIELDS. AND JUST $50 PROVIDED A VILLAGE IN TOGO WITH MATERIALS TO BUILD GRAIN STORAGE HUTS AND GRANARY JARS TO STORE MILLET BOUGHT CHEAPLY DURING HARVEST SEASON TO TIDE VILLAGE FAMILIES THROUGH THE DRY SEASON. IN THIS VILLAGE NO ONE WENT HUNGRY, AND OTHER NEARBY VILLAGES BECAME INTERESTED IN DUPLICATING THE PLAN.

I HAVE BRIEFLY OUTLINED ABOVE SOME OF PEACE CORPS' COLLABORATIVE PROJECTS. MUCH OF THE TECHNOLOGY USED IN THESE PROJECTS ARE DEVELOPED IN THE U.S. AND OTHER COUNTRIES AND BROUGHT TO THE FIELD BY PEACE CORPS VOLUNTEERS.

RESEARCH AND DEVELOPMENT: FIELD APPLICATIONS

THE WORLD BANK HAS CONCLUDED THAT: "THE MAJOR PROBLEM [IN IMPROVING AGRICULTURAL PRODUCTION] IS TO DEVELOP A MORE EFFECTIVE USE OF EXISTING RESEARCH CAPACITY....RESEARCH RESULTS HAVE NOT BEEN ADEQUATELY DISSEMINATED...RESEARCHERS ARE ISOLATED FROM FARMERS AND EXTENSION WORKERS, SO NOBODY CAN SEE THE DIRECT RELEVANCE." PEACE CORPS IS WORKING TO BRIDGE THE GAP BETWEEN RESEARCHERS AND THE VILLAGES--TO BRING RELEVANCE TO THAT TECHNOLOGICAL LINK SO VITAL TO PROGRESS.

THERE ARE NEW SEEDS, TREE VARIETIES, TECHNOLOGICAL BREAKTHROUGHS, AND VACCINES DEVELOPED EVERY YEAR IN THE U.S. AND OVERSEAS. A GREAT DEAL OF THESE RESOURCES ARE DEVELOPED BY USAID AND OTHER MAJOR U.S. ENTITIES, AND THEN CARRIED INTO THE FIELD BY PEACE CORPS VOLUNTEERS.

IN AGRICULTURE, DROUGHT RESISTANT SORGHUM AND OTHER CROP VARIETIES DEVELOPED, IN LABORATORIES ARE BEING INTRODUCED TO SMALL FARMERS AROUND THE WORLD BY PEACE CORPS VOLUNTEERS, AS ARE FAST GROWING TREE VARIETIES THAT PROVIDE FUELWOOD.

IN THE FIELD OF HEALTH--AN IMPORTANT COORDINANT TO AGRICULTURAL PRODUCTION--METHODS OF COMBATING COMMUNICABLE CHILDHOOD DISEASES ARE BEING DEVELOPED BY USAID AND USED BY VOLUNTEERS IN THEIR VILLAGES. VOLUNTEERS ARE TRAINED IN ORAL REHYDRATION THERAPY DEVELOPED BY USAID AND UNICEF, AND AS A RESULT, INFANT MORTALITY IS BEING REDUCED. VACCINES FOR MALARIA AND SCHISTOSOMIASIS ARE BEING DEVELOPED, TO BE USED WORLD-WIDE BY VOLUNTEERS AND OTHER DEVELOPMENT ASSISTANCE WORKERS.

MORE IMPORTANT THAN THE SPECIFIC TECHNIQUES AND TECHNOLOGIES THEMSELVES ARE THE SKILLS TO DEVELOP, ADAPT AND APPLY THE CONTINUUM OF TECHNOLOGIES THAT WILL BE THE REALITY OF THE NEXT DECADE, SINCE EVEN OUR "NEW" TECHNOLOGY OF TODAY WILL SOON BE OUTDATED. THIS IS WHERE PEOPLE-TO-PEOPLE LINKS AND TRANSFERRING SKILLS THROUGH EXAMPLE CAN MAKE SUCH A VITAL DIFFERENCE.

AT PEACE CORPS, AN OFFICE OF INFORMATION COLLECTION AND EXCHANGE WAS CREATED IN 1975 SO THAT STRATEGIES AND TECHNOLOGIES DEVELOPED BY THE VOLUNTEERS, THEIR COWORKERS AND COUNTERPARTS COULD BE MADE AVAILABLE TO OTHER VOLUNTEERS AND OTHER DEVELOPMENT ORGANIZATIONS WHO MIGHT FIND THEM USEFUL. THIS HANDS-ON INFORMATION BASE IS PART OF PEACE CORPS' LARGER CONTRIBUTION TO DEVELOPMENT.

PEACE CORPS AND THE FUTURE OF AFRICA

THE CHALLENGE

IT IS WIDELY RECOGNIZED THAT THE PREVENTION OF FURTHER FAMINE IN AFRICA HINGES UPON INCREASING FOOD SELF-SUFFICIENCY AMONG THE SUB-SAHARAN NATIONS. LONG-TERM PROJECTS AIMED AT ASSISTING SMALL FARMERS AND VILLAGES TO MOVE FROM CONSUMPTION TO PRODUCTION HAVE A PROVEN RECORD OF SUCCESS, AND IT IS IN THIS MANNER THAT PEACE CORPS MAKES ITS CONTRIBUTION. THE MISSION HAS BEEN IDENTIFIED IN AFRICA--PEACE CORPS IS AT THE RIGHT PLACE AT THE RIGHT TIME.

FOR TWENTY-FIVE YEARS, THOUSANDS OF VOLUNTEERS HAVE WORKED IN AFRICA AT THE GRASS ROOTS LEVEL. EACH TOUCHES MANY LIVES, BY SHOWING NEW TECHNIQUES, BY DISPLAYING THEIR LEADERSHIP, BY TEACHING FARMERS AND TRAINING TEACHERS, BY LIVING WITH PEOPLE AT THE VILLAGE LEVEL SHOWING THEM THE WAY BY EXAMPLE FOR A BETTER LIFE. A RECENT PEACE CORPS STUDY SHOWED THAT IN THE COMBINED AREAS OF

AGRICULTURE, FISHERIES, FORESTRY, HEALTH/NUTRITION, AND WATER/SANITATION, APPROXIMATELY 1200 VOLUNTEERS (ABOUT 45 PERCENT OF THOSE SERVING IN AFRICA) HAD A DIRECT EFFECT ON:

--3,290,964 PEOPLE
--406,888 FAMILIES
--6,069 COMMUNITIES

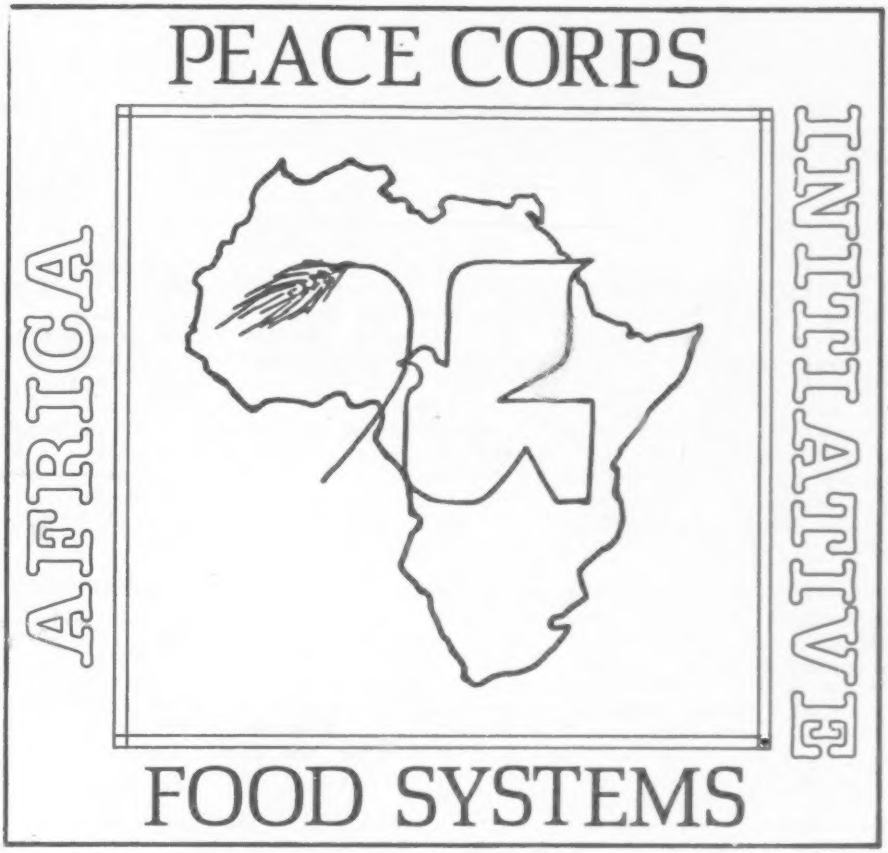
AND THOSE SAME VOLUNTEERS HAD AN INDIRECT EFFECT ON:

--12,708,850 PEOPLE
--872,036 FAMILIES
--11,672 COMMUNITIES

PEACE CORPS PROJECTS ARE TARGETED TO THE SMALL FARMER, WITH SPECIAL EMPHASIS ON THE ROLE AFRICAN WOMEN PLAY IN FOOD PRODUCTION, AND EMPLOY BASIC, AFFORDABLE, APPROPRIATE TECHNOLOGIES AVAILABLE TO THE PEOPLE SERVED. RESOURCE SHARING BETWEEN VOLUNTEERS--BY WORD OF MOUTH OR THROUGH PEACE CORPS' INFORMATION COLLECTION AND EXCHANGE--WIDENS THE EFFECTIVENESS OF PEACE CORPS PROGRAMS, AS DOES COLLABORATION BETWEEN OTHER ASSISTANCE DONORS--PRIVATE VOLUNTARY ORGANIZATIONS AND GOVERNMENT ENTITIES. WE AT PEACE CORPS ARE ENCOURAGING MORE APPROPRIATE RESEARCH AND DEVELOPMENT AT THE UNIVERSITY, INDUSTRY, PRIVATE VOLUNTARY ORGANIZATION AND GOVERNMENTAL LEVEL. WE CAN PROVIDE THE ONE-ON-ONE TRAINED MANPOWER TO DISSEMINATE RESEARCH FINDINGS TO THE VILLAGES AND PEOPLE WHO CAN USE IT BEST.

THE CHALLENGE PRESENTED BY THE AFRICA FOOD CRISIS IS UNPRECEDENTED. THE SOLUTION HAS NO EASY SOLUTIONS OR QUICK FIXES. THE SOLUTION WILL LIE IN AN INTENSIVE, LONG-TERM INTERNATIONAL EFFORT. THE AFRICANS THEMSELVES ARE RESPONDING TO THAT CHALLENGE. ALL THEY ASK IS HELP IN DOING THOSE THINGS THAT

NEED TO BE DONE. BEYOND HUMANITARIAN CONCERN, REALITY DICTATES OUR RECOGNIZING THAT AFRICA'S FUTURE IS OUR OWN. AS PEACE CORPS ENTERS ITS 25TH YEAR OF SERVICE, ITS EXPERIENCE IN GRASS ROOTS DEVELOPMENT AND ITS UNIQUE CAPACITY TO FIELD QUALIFIED, ADAPTABLE, AND SENSITIVE TECHNICAL ASSISTANCE AT THE VILLAGE LEVEL PLACE IT IN A POSITION TO PROVIDE A VITAL CONTRIBUTION IN RESPONSE TO THE CHALLENGE. POLICY REFORM PROVIDES THE CONTEXT. HIGH LEVEL RESEARCH PROVIDES THE TECHNOLOGICAL BREAKTHROUGHS. BUT ONLY AT THE VILLAGE LEVEL, WHERE INCENTIVE AND TECHNOLOGY MUST FUSE WITH SOCIAL, CULTURAL AND ECONOMIC REALITIES, WILL THE FINAL BATTLE AGAINST HUNGER BE WON.


PEACE CORPS
AFRICA
INITIATIVE
FOOD SYSTEMS

THE PEACE CORPS AFRICA FOOD SYSTEM INITIATIVE

The Africa Food System Initiative is a long-term (ten year) collaborative effort assisting up to 12 African nations in their struggle to reverse declining per capita food production and attain self-sustaining food systems. During 1986, the program will begin in four pilot countries: Mali, Zaire, Niger and Lesotho. Expansion to an additional four countries will take place beginning in 1988 following an evaluation of Phase I.

Under the Initiative, Peace Corps' role is to assist local institutions and communities develop, adapt and implement appropriate technologies designed to overcome food system obstacles. Key objectives include not only the development of self-sustaining food systems but also the upgrading of local capacity, both public and private, to continue the development process. Twenty-five years of community level development efforts in Africa provide Peace Corps with a proven methodology, a strong reputation and considerable programming insights. Peace Corps' method of applying that experience to the complex challenges of the food crisis in Africa reflects the nature of the problem itself: long term, multi-faceted and focused on the small farmer.

In each country, program development begins with a thorough assessment of existing food systems in order to identify major micro-level constraints on increased food availability. These are then related to the broader macro-level context. Peace Corps, while focussing at the village level, thus also participates in an on-going policy dialogue with host government officials underscoring the relationship between national policies and the responsiveness of the production and distribution systems.

Once the constraints have been identified, a smaller subset, relevant to Peace Corps' capabilities, and restricted to a defined geographical area or areas, becomes the basis for the development of long-term goals. Follow-up design activities determine specific short-term objectives, volunteer assignments, and management and training strategies.

In its implementation, the Food System Initiative makes use of a multi-faceted, multi-phased, team approach to address the interrelated problems of the agricultural system. Though volunteers have often assisted each other in the field, the Initiative's focus on long-term goals and a systems approach requires that such collective efforts are explicit parts of job definition. Volunteers with different skills and/or with different levels of similar skills work together to meet target objectives. As this implies, teams may work on problems from pre-production (including such things as land preparation and water supply), through production to post-production (including storage and preservation, processing, marketing and nutrition education). The specific skill mix represented in a given team, at a given time, is determined by an on-going process of assessing evolving needs and opportunities.

The pilot programs under the Initiative best illustrate the nature of Peace Corps' response to the food crisis in Africa:

Mali: The Mali Initiative targets three separate agricultural zones--rainfed, irrigated and mixed. In all three, volunteers will work with farmer groups to upgrade their capacity to respond to new incentives and a range of technical packages. Work with farmers who are women will be a major emphasis. In the rainfed area, volunteers will be integrated into a major AID agricultural development effort and will initially concentrate on the effectiveness of farmers' associations. In the mixed rainfed/ irrigated area around Segou, volunteers will cooperate with a project principally funded by the European Economic Community. They will emphasize dry-season vegetable production, agro-foresty and simple irrigation. In the semi-desert conditions around Timbuctu, only irrigation provides hope for increased food security. Volunteers will work on the development of small-scale irrigation activities including several initially begun by AID and now continuing under the American PVO, AFRICARE. Approximately 35 volunteers will be sent to Mali in 1986 with program expansion of up to 75 volunteers by 1988.

Zaire: The size and diversity of Zairian agriculture combined with the absence of basic infrastructure (roads, markets, agricultural research, extension and credit facitlities, etc.), make it one of the most challenging of all African countries. At the same time, Zaire's untapped agricultural potential is enormous. Not only does it have the capacity to feed itself once again, but it could also provide considerable food exports to its neighbors. Peace Corps' Zaire Food Systems Initiative is initially based in three region--Bandundu, Kivu and Kasai, with expansion to Shaba slated for 1987. The first teams of volunteers will concentrate on soil development and the introduction of new plant materials, improvement of animal husbandry techniques, water development, and nutrition education. Up to 75 new volunteers will be sent to Zaire during 1986, with an equal number following in 1987 and 1988.

Lesotho & Niger: The assessment and design phases of Initiative activities in Lesotho and Niger are taking place during the latter half of 1986. Though widely seperated geographically and in the nature of their food systems, both have identified water development as a critical starting point for increased food output. In Niger, volunteers will also work on the development of dry season agricultural activities using small-scale irrigation. In Lesotho, volunteers will focus on marketing questions related to vegetable production and be integrated into a major AID-funded agricultural project. Volunteer numbers for each of these countries will be determined during the assessment and design process.

Activities Relating to Increased/Improved Agricultural Inputs:

1. Small-scale irrigation systems using wells, spring capping, water catchment systems and/or improved water control in swamps. Improved pump and small-scale irrigation system maintenance in areas where these exist.

2. Improved mechanical power through animal traction.

3. Improved seed multiplication and storage of planting material both on and off farm.

4. Production of local fertilizers; green manure crops suitable to the local area; mulching materials; alley cropping; and improved composting methods.

5. Blacksmithing and local manufacture or repair of agriculture tools, implements and animal-drawn machinery. Business development for small-scale input retailers.

6. Integrated pest management stressing alternatives to chemical pesticides and, as appropriate, the safe use of chemicals.

7. Agro-forestry (mixed cropping systems, tree crops, dune stabilization, windbreaks, alley cropping, etc.).

Activities Relating to Food Production:

1. In coordination with national and regional efforts, the introduction of improved varieties of existing major food crops (particularly maize, rice, sorghum, millet, cowpeas, etc.) and/or the introduction of improved and appropriate cultural practices (ground preparation, spacing, mixed cropping, timing of operations, etc.).

2. Small animal husbandry (poultry, rabbits, pigs, goats and sheep). Fish culture. The improved integration of animal husbandry into crop production systems. Agro-forestry, nursery development. Tree planting for firewood.

3. Vegetable production, home gardening -- both rural and urban. Beekeeping, and other dry-season income-generating activities.

Post-Production Activities:

1. Processing and preservation of food crops (solar drying, local grain mills, introduction of new food technologies/recipes, etc.).

2. Storage of food crops both on and off the farm (timing of harvest, crop gathering techniques, improved storage design, and crop treatment as appropriate).

3. Agriculture marketing and distribution (use of improved farm carts, producer co-op and farmer association management, simple market information systems, local road improvement, transportation cooperatives/businesses etc.).

Mr. SCHEUER. Thank you for that marvelous testimony.

I am going to yield to Congresswoman Schneider, but I do want to ask you just one question.

You mentioned that the Peace Corps volunteers are well situated at the village level to provide technical information. You just said that about a minute ago. Are they also well situated at the village level to begin to change some attitudes, attitudes about the role and status of women? Can they convince the chiefs and the men who dominate the village that it would help everybody if women who raise most of the food are better educated, have more access to information? Are they in a position to convince young men, as well as young women, that they would have healthier and happy families if they control their fertility and space their children? Are they in a position to chat informally with women, to help them decide—to help them make decisions about their family size goals and to help them think through the business of selecting a contraceptive option that is appropriate for them and their husbands?

This is not just technical assistance. These all involve judgments and attitudes. It would be my impression from having watched Peace Corps people at work across the length and breadth of Africa that they are the best ambassadors we have by far. They are a marvelous group of young people. That they have achieved an unbelievable degree of acceptance. I have seen Peace Corps—I have driven out in a jeep to rural areas of sub-Saharan Africa with a Peace Corps volunteer who is returning after 2- and 3-week vacations, and I have waited in the jeep as they got out of the jeep and walked into the village. To see the entire population of that village rush up to them and greet them effusively, with love in their hearts and respect, and credibility just showing so evidently has been an enormously heart-warming experience for me.

I can't express adequately my admiration for the job that the Peace Corps has done, and the quality of people that they have sent to these communities and my absolute admiration for the way they have been accepted.

So just to repeat the question, aren't they capable of doing more than providing technical assistance? Can't they help change attitudes in these various areas that I have mentioned? Do you help them do that? Do you include this in your training?

Mrs. RUPPE. Well, certainly given alone the fact that this is one of the only groups of people who are willing to spend 5 and 6 hours a day learning the language of the people that they are going to be living with, and who are willing to live at the same level and in remote areas across the countries that we are in, they do have a unique opportunity, unique challenge, unique chance to really help in development. We work very closely with our host country ministries, with the private voluntary organizations that are in the country, you know, to establish a basis of trust and to work together, working with motivated people in the communities that we are in.

So, I would say yes to virtually all of your questions. Working closely in the different program areas that we are in, certainly in oral rehydration therapy, we have made tremendous advances there. Getting our training through AID, again that careful coordination has really helped give our volunteers more skills over the years. I mean, I have visited African leaders who either trained our volunteers or were trained by them. Certainly that has given the people, those leaders a better impression of America and an interest in developing the right kind of partnerships.

But I think, Congressman—Mr. Chairman, you also would be very interested in knowing what it has brought back to America. Indeed, there isn't going to be any group that you have testified before you or one of your own members of your committee, Congressman Henry, is a return Peace Corps volunteer. You will see that the PVO's, the development—the Agency of International Development, the head of it, Peter MacPherson, all served in the Peace Corps. They have come back really to show our Nation how to establish the right kind of relationships and partnerships through peace through development in the future.

So I would say yes, our volunteers are in a unique way able to really transfer the appropriate technologies——

Mr. SCHEUER. Yes; I am not talking just about technology transfer. I am talking about changing attitudes. Could you try and be a little specific, on several of the——

Mrs. RUPPE. Many leaders have told me that the thing they see our volunteers do——

Mr. SCHEUER. Let me just——

Mrs. RUPPE [continuing]. Is empower, if that is——

Mr. SCHEUER. Let me just pinpoint it. On increasing and improving the role and status of women——

Mrs. RUPPE. We have been leaders in that.

Mr. SCHEUER [continuing]. On talking to young couples—huh?

Mrs. RUPPE. We have been leaders in that. All of our training includes strong components for women in development for both our male and female volunteers. Our community of volunteers is now virtually 50-50, male-female volunteers.

Mr. SCHEUER. No; I am talking about your volunteers using their influence and their credibility in the villages——

Mrs. RUPPE. Yes.

Mr. SCHEUER [continuing]. To encourage improvements in the status and role of women, to encourage young couples to control their fertility——

Mrs. RUPPE. Well, Mr.——

Mr. SCHEUER [continuing]. To explain to young women what their—young couples what their contraceptive options are, to explain to the village——

Mrs. RUPPE. Well, we've been involved very much in promoting better health at the village level, promoting agriculture production, bringing women in to train, including them in any planning—that is one of the keys to development. We have been leaders. At the very conference that Congresswoman Schneider is talking about, we had a strong input there of rural Kenyan women coming in to the conference. Women that our volunteers work with, that we have worked with for many years now to bring them into the development process.

We have done in Nepal—well, we will stick with Africa. I was going to say in Nepal. But I mean you have got income generation where loans are available from banks. We are the key linkage to women to encourage them, to show them how to do prefeasibility studies, to have bookkeeping skills. That is critical for women, if they do get some money, to understand really how to reinvest, how to save, how to keep track of it.

So, yes, Mr. Chairman, we really are leaders in women in development. And I would be happy to submit a special report to this committee on the history of Peace Corps with women in development because we have been in from the very beginning.

Mr. SCHEUER. Well, we invite that.

Mrs. RUPPE. Thank you.

[The information follows:]

PEACE CORPS

WOMEN IN DEVELOPMENT AND THE PEACE CORPS: A CHRONOLOGY

Peace Corps' Women in Development mandate came about in response to the passage of the 1973 Percy Amendment to the Foreign Service Act, which called for particular attention to the integration of women into U.S. assistance programs.

1978 Following the precedent of the Percy Amendment, the Peace Corps Act was amended in 1978 to include women in development as an integral part of agency policy. The amendment reads as follows:

> "In recognition of the fact that women in developing countries play a significant role in economic production, family support and the overall development process, the Peace Corps shall be administered so as to give particular attention to those programs, projects and activities which tend to integrate women into the national economies of developing countries, thus improving their status and assisting in the total development effort."

1979 The Peace Corps Director made a formal commitment to integrate this WID mandate into all Peace Corps programming.

1979-1981 A part-time WID coordinator, based at PC/Washington, headed an agency WID group which accomplished the following:

Produced and distributed the Peace Corps Volunteer training manual Third World Women: Understanding Their Role in Development.

Integrated a focus on women in development into all overseas staff training.

Established regional WID groups throughout Peace Corps.

Identified a WID coordinator in each Peace Corps country.

Completed an inventory of WID projects in PC countries.

Established WID resource centers in most country offices.

1982- Peace Corps Director Loret Miller Ruppe established a WID office and
1984 appointed a full-time agency WID Coordinator.

Peace Corps sponsored a symposium on WID for 260 women leaders from developing countries and international development agencies.

A new Women-to-Women Partnership program was created within the existing Peace Corps Partnership program, enabling women's groups in the U.S. to provide financial assistance to income generating projects for women in developing countries.

Peace Corps' Women in Development Resource Directory was compiled and distributed to PC countries and offices throughout the agency.

The WID office produced and distributed the manual Beyond the Borders: Broadening Women's Choices for Income Generation.

A focus on WID was integrated into PC training manuals in fisheries, forestry and other program sectors.

The WID Coordinator and consultants visited over 20 countries to review programs and projects and assist with new programming.

The WID office produced a 15-minute slide/tape show on WID for PC staff, Volunteers and prospective Volunteers.

An information packet on programming for WID was developed. Nearly 2000 copies have been distributed by Peace Corps' Information Collection and Exchange office.

1985 Peace Corps' WID office continues to be responsible for the integration of a concern for women into all phases of Peace Corps programming and training. The WID office:

Trains all new overseas staff in programming appropriate to the roles and needs of women;

Develops training materials and manuals for Volunteers on working with women;

Networks with PVOs working in the field;

Evaluates ongoing Peace Corps projects.

OTAPS/WID
5/28/85

Mr. SCHEUER. How about your Peace Corps people, particularly your women volunteers, in working with your young couples, young women, advising them on family planning and the desirability of setting sensible family size goals?

Mrs. RUPPE. Well, our programs have primarily been keyed in with the requests from the ministries of health in the countries that we work in, and that really has had many volunteers out at rural health clinics where they are very actively in doing prenatal care, in growth charts, oral rehydration therapy, better nutrition—a lot of nutritional education.

Mr. SCHEUER. I haven't heard you mention the word family planning yet.

Mrs. RUPPE. Well, actually at this point in time most ministries of health have not really gotten our volunteers involved in that. I know that they certainly probably do counseling because they are in contact with many women. But our primary goal has really been more in prenatal care, oral rehydration therapy, preventive medical health.

But as countries grow in this field, I mean we certainly will talk with ministries of health.

Mr. SCHEUER. It seems to me that since you have this rather astonishing level of credibility and acceptance that it would be easy in a relaxed way while you are talking about oral rehydration and while you are talking about better sanitation, better nutrition for young kids that you could—that a young woman Peace volunteer could talk to a young couple or a young woman about the benefits of spacing her children for the obvious health benefits to herself and the already—and her already born children.

Mrs. RUPPE. I think, Mr. Chairman, as the attitudes in Africa, we have always tried to be very culturally sensitive in the countries we are in and not be confrontational. That is why I was kind of getting a little away from changing attitudes. We want to work with motivated people and give them the skills to encourage that motivation, to empower them. Certainly as these countries are—it really has only been in the recent years that they are really strongly getting into family planning. Certainly we will be talking with their health ministries and seeing how we can share in their development goals.

Mr. SCHEUER. Excellent.

Congresswoman Schneider.

Miss SCHNEIDER. Thank you.

Let me say that I commend you on your testimony, about not only what you are saying here today, but what you have been doing over the past couple of years because I certainly look upon your leadership in the administration for the Peace Corps programs as one of the more stellar performances that we have to look to, not only as an implementer of programs, but also as a great woman role model. So I am very proud of the activities that you have been involved in.

We have looked closely at the Peace Corps from the agricultural research and environmental technology transfer point of view, and our studies indicate that approximately 10 percent of all the Peace Corps volunteers are currently working on environmentally related projects and about 70 percent of them are directly involved in the forestry end of things, and maybe about 30 percent in some of the broader environmental aspects like park planning, wildlife management, environmental education. But it does appear that the Peace Corps right now is limited by a lack of an institutional focus within the agency in that you do not employ a one, single, permanent full-time employee to coordinate environmental projects.

And it is interesting to note that one of the two people in charge of the forestry and other natural resource projects is on loan to the agency from the U.S. Park Service, and the other person is funded by the Agency for International Development. So despite your good efforts it seems that you are, perhaps, a little shorthanded, particularly in the area that this committee is focusing on, and don't quite have the capacity to fill the demand for some of the natural resource specialists over the next couple of years, as some of the studies that are taking place seem to indicate.

It also appears that the demand for forestry specialists is on the increase, and regrettably there is a decrease in those folks who are applying for that particular kind of job. As a result, about 70 percent of the formal requests for environmental assistance are being met, and we would like to see how you can achieve a 100 percent response.

So one of the things that I think I would like to recommend and I would like your feedback on would be to enable the Peace Corps the opportunity to strengthen and expand your forestry and natural resource sector by hiring a permanent Peace Corps staff, and also to develop a comprehensive plan. So maybe let's talk first about the staff.

Are you in agreement that it is a little bit confining to have to deal with two employees that are not your own full-time folks to address environmental problems?

Mrs. RUPPE. Well, having gone to the Forestry Service 2 years ago to beg them to renew the gentleman who is sitting on my left, the tenure with our office where he has done such exceptional service, certainly it is very difficult. But as you might know, this summer we almost had to go on a furlough basis because of being over our FTE limits. So we have to watch our figures very closely.

We are very much involved in the Reform 1988 efforts, but it impacts particularly on our ability to field and support volunteers in that we have a 5-year rule in our agency, which means we have a great deal of turnover. And with each one of these initiatives, many people don't realize volunteers to really be effective must have strong staff support. They must have—we are in very—countries with very poor transportation mainly, with little infrastructure, and to support volunteers takes a great deal of time and effort.

So, yes, certainly the whole question you bring up is one that is very sensitive to us. We would like to have a fully—you know, a full forestry component. We are structuring our African Food Systems Initiative, you know, of course, has every phase of environmental protection in it. I mean, range management if it is needed, natural park setups—all those different things. Forestry, agroforestry to a great extent.

So we certainly feel that that forestry and the whole question of natural resources—Jack Vaughn, our second director, pointed out that he felt our whole focus should be on that. Indeed, when you really think of promoting food production in Africa, that is really what you are talking about——

Miss SCHNEIDER. Exactly. That is the core.

Mrs. RUPPE [continuing]. Is overall environmental control and development. So we are going to make every effort to increase our target, and we would like to be able to say we would pay for these people and have them on our direct FTE rolls, but it would mean, then, that another area in the agency would——

Miss SCHNEIDER. Suffer.

Mrs. RUPPE [continuing]. Would have to suffer. So.

Miss SCHNEIDER. Well, we will see what we can do from this end of things.

How about your recruiting program to attract volunteers with some environmental or health and pollution control backgrounds?

Mrs. RUPPE. Well, we have—there is no question this is shrinking. I mean, there is a shortage of these people. Plus another problem in forestry over the years has been there has not been an adequate international outlook to our forestry schools. That is changing somewhat, but it needs to be addressed more.

We have gone to the forestry schools. We have targeted them. I think we are getting a better response. We are looking for retired foresters. We have talked with Weyerhaeuser, with the forestry industry, and said, can we get into your preretirement counseling. I would certainly like to see more of an effort made to encourage all of agro-industry to think of loaning people to the Peace Corps on leaves of absence.

Miss SCHNEIDER. That is a terrific, wonderful idea.

Mrs. RUPPE. I think they are very much needed. I think the land grant colleges, those that have strong forestry, agro, departments, should be encouraged to have a scholarship system. This has already been suggested in some legislation, but, of course, things like that need to be funded. And so there are no end of opportunities I think. Plus we can also take generalists, our wonderful liberal arts graduates; and if we have the money to train them, can train them to be extremely effective in many of the areas we are in.

So all of those. We have got to come up with creative, innovative, I think, ideas like that to fill the requests that we are getting. No other agency can send them over at less cost, and it seems that nobody has more impact than a Peace Corps volunteer.

Miss SCHNEIDER. Well, you just led me into my next question which had to do with the role of the private sector. And I think it is exciting that you are looking toward retirees of Weyerhaeuser and other areas. Also, the role of international environmental organizations. It is interesting to note, since this is an area where I have been heavily involved for years, that many of the national environmental groups are expanding and the focus so much now is not just limited to our own backyard, but rather to global pollution and global environmental concerns, and certainly resource management is a key priority, in particular here in the Congress, even though we are not a nongovernmental organization. The Energy and Environment Institute, which has compiled I think a terrific study, has many different opportunities for access to nongovernmental organizations.

I am wondering what we, Members of Congress, might be able to do, or me in particular, because I speak to different corporations and I speak to different environmental groups, and oftentimes I am talking about environmental or global problems. How can I get a commission on recruiting for you? How can I help to carry your message?

It assumes amusing, every time I turn on the television, whether you be on an NBC news program or one of your public service advertisements at 1 o'clock in the morning, I see your smiling face there, but I think that obviously you are indicating that you could use some help in spreading the word. And I think that many of us here are dedicated to your same efforts and would like to help out.

So what can we do to get the private sector and the environmental groups to assist you? Do you have a game plan?

Mrs. RUPPE. Well, I am very pleased to say that just a few days ago I signed a letter thanking the World Wildlife Fund that has provided a grant to a volunteer working in park management in a western African nation. We have gotten quite a few of the private volunteer organizations and foundations to contribute through our Peace Corps partnership program which funds individual projects overseas, but now even in actually supporting a volunteer project in environmental control.

I think certainly Congressmen already have been extremely generous in putting us in your newsletters to encourage applications in scarce skill areas. I think if Congress people are talking to agroindustry, to different industries in their areas that could help, suggest leaves of absence, suggest if they have a foundation that might help fund a training center for agricultural people in Africa. We have been talking to Ralston-Purina, to Pillsbury, about possibilities like that. Why couldn't they set up a training center where our volunteers could bring in their counterparts for the next step of implementing this transfer of appropriate technology.

We are going to need more vehicles to really, in this team approach where we are going to have teams of volunteers in geographic regions, that means that the technical backstopping for those volunteers would need to travel around.

So we have a host of projects and we certainly would welcome any outreach. If you are writing any articles for technical journals in the field of environmental quality, we would appreciate asking them to recruit for us for Peace Corps.

Miss SCHNEIDER. Great. I was told that I am out of town, but I just have to ask a real quick parochial question and maybe you can give me a quick answer.

The Opportunities Industrial Centers [OIC] which are based here in the United States, focus on inner-city blacks, and obviously they have a closer cultural link with Africa more so than we whites and many other ethnic groups. Are you working at all with the OIC, or are they working with you? I know they have seven projects in Africa, in Togo and other such places. Is there any involvement with OIC?

Mrs. RUPPE. We are working with over 200 private voluntary organizations overseas, but could I get that information for you?

Miss SCHNEIDER. Sure.

Mrs. RUPPE. Could we do a survey, a scan of them?

Miss Schneider. That would be greatly appreciated.

Mrs. Ruppe. If we aren't, we certainly will be in touch with them.

[The information follows:]

ORGANIZATIONS COLLABORATING WITH PEACE CORPS:

Name of Organization	Countries where Active
Action AID	Gambia, Kenya
Africare	Burkina Faso, CAR, Mali
African Wildlife Foundation	Burundi
African Wildlife Husbandry Development Association	Burkina Faso
Agua del Pueblo	Guatemala
*Aid to Artisans	Honduras
Alimentos, S.A.	Guatemala
Ambassador's Discretionary Fund	Costa Rica
American Friends of Ghana	Ghana
American Women's Club	Botswana
American Women's Club of Tunis	Tunisia
APROFAM	Guatemala
Asia Foundation	Philippines, Western Samoa
Asian Development Bank (ADB)	Nepal, Western Samoa
Auburn University	Honduras
Australia	Fiji
Australian Aid	PNG
Australian High Commission	Solomon Islands
Australian Volunteers Abroad	Western Samoa
Baptist Mission	Senegal
Belgian Technical Association	Burundi
British AID	Nepal
British Christian AID	Zaire
British Council	Botswana, Morocco, Senegal, Sri Lanka
British Development Division/ High Commission	Jamaica, Montserrat, St. Kitts/Nevis St. Lucia
British Senegalese Institute	Senegal
British Technical Assistance	Lesotho
Brother's Brother	Jamaica
Canada	Niger
Canadian Development Assoc.	Burundi
Canadian Embassy	Philippines, Senegal, Zaire
Canadian High Commission	Kenya
Canadian International Dev. Agency (CIDA)	Barbados, Ghana, Nepal, St. Kitts/Nevis, St. Lucia

* Indicates a Memorandum of Understanding exists between Peace Corps and the organization.

Name of Organization	Countries where Active
Canadian University Service Overseas (CUSO)	Belize, Gambia, Sierra Leone, PNG
Canadian Volunteer Organization	Cameroon
CARDATS	Montserrat
CARE	Cameroon, Dominican Rep., Ecuador, Guatemala, Kenya, Lesotho, Mali, Nepal, Niger, Philippines, Sierra Leone
Caribbean Ag. Research & Development Institute (CARDI)	Dominica, Montserrat
Caribbean Basin Iniative	Belize
Caribbean Development Bank	Belize, Montserrat, St. Kitts/Nevis St. Lucia
Caritas	Guatemala, Honduras, Mauritania
Carnegie Museum	Paraguay
Catholic & Protestant Therapy Centers	Cameroon
Catholic Jesuit Foundation	Honduras
Catholic Mission in Wenchi	Ghana
Catholic Relief Services (CRS)	Cameroon,Costa Rica, Dominican Rep., Ecuador, Gambia, Ghana, Lesotho, Mauritania, Paraguay, Philippines, Sierra Leone, Senegal, Togo, Zaire
Cathwel	Togo
Center for British Teachers	Morocco
Centro Agronimico Tropical Investig. Ensenenza (CATIE)	Honduras
Centre for Economic Dev. & Administration (CEDA)	Montserrat
Christian Children's Fund	Guatemala
Church Missionaries	Malawi
Church Organizations	Liberia
Church World Services	Niger, Seychelles
CIPEC	Senegal
Club 20-30	Costa Rica
CODE	Gambia
COHATT	Honduras
Colgate Palmolive	Guatemala
Committee for the Handicapped-People to People Programme	Sierra Leone
Commonwealth Association of Science & Math Educators	Jamaica
Commonwealth Dev. Corp. (CDC)	St. Lucia
Commonwealth Nations	Barbados

Name of Organization	Countries where Active
Community Dev. Trust Fund	Tanzania
Confederacion Latinoamericana Cooperatives Ahorra Credito (COLAC)	Paraguay
Consortium for International Development (CID)	Belize
COSUDE	Paraguay
Credit Union National Association (CUNA)	Paraguay
Cristoffel Blinden Mission	Malawi, Sierra Leone
Damas Norteamericanas	Ecuador
Danish Volunteer Service	Botswana
Darian Book Plan	Nepal
DIGISA	Guatemala
DIGESEPE	Guatemala
Diocese of Basankusu	Zaire
Dutch Embassy	Zaire
Dutch Foreign Aid	Mauritania, Nepal
Dutch Government	Jamaica
Dutch Volunteer Organization	Cameroon, Mali, Nepal
Embassy's Self-Help Funds	Cameroon, Lesotho, Sierra Leone
Environmental Development Agency (ENDA)	Senegal
Escuela el Sembrador	Honduras
European Development Fund (FED)	Burundi, Dominica, Togo
European Economic Community	Belize, Barbados, Lesotho, Sierra Leone, St. Lucia
FAC (France)	Togo
Federal Republic of Germany	Sierra Leone
Fiji Council of Social Services	Fiji
FNUAP	Honduras
Food & Agriculture Or. (FAO)	Barbados, Fiji, Honduras, Kenya, Nepal, Senegal, Sierra Leone
Ford Foundation	Jamaica
Foster Parents	Ecuador, Honduras, Philippines
Foundation for Peoples of the South Pacific (FSP)	Fiji, PNG, Solomon Is., Tonga
French Foreign Aid	Mauritania
French Volunteer Organization	Cameroon, Mali, Niger
French Technical Cooperation	Dominica
Friends of the Americas	Honduras
Fundacion Progrssio	Dominican Rep.
Geeste Industries Ltd.	St. Lucia

Name of Organization	Countries where Active
German Foreign Aid	Mauritania
German Medical Foundation	Gambia
German Tech. Assistance (GTZ)	Sierra Leone, Sri Lanka, Western Samoa
German Volunteer Organization	Cameroon
German Volunteer Service (GVS)	Botswana, Nepal
*Goodwill Industries	Cameroon
GOVA	Ghana
Great Britain	Fiji
Groutte de Lait	Senegal
Halfway Home Foundation	Philippines
HCJB	Ecuador
Heifer Project International	Cameroon, Ecuador, Honduras, Zaire
Helen Keller International	Mali
Helvetas	Cameroon
ICLARM	Philippines
ICRISAT	Niger
IDA	Sierra Leone
Institut for Food Research (ITA)	Senegal
Institut National d'Education et de Formation	CAR
Instituto Cooperativo Ecuanteriano	Ecuador
Instituto Interamericano de Agricultural Dev. (IICA)	Dominica, Paraguay
IICA Member Country Govs.	Jamaica
Instituto de Nutricion de Centro America y Panama (INCAP)	Guatemala
Instituto Superior de Agric.	Dominican Rep.
Instituto Tecnico de Capacitacion (INTECAP)	Guatemala
Inter-American Community of Women - OAS	Jamaica
InterAmerican Develop. Bank	Barbados
*Inter-American Foundation	Belize, Costa Rica, Paraguay, St. Kitts/Nevis
International Council for Research in Agroforestry (ICRAF)	Burundi
International Executive Service Corps	Malawi
International Fund for Ag. Development (IFAD)	Dominica
International Human Assistance Program (IHAP)	PNG, Solomon Is. Philippines

Name of Organization	Countries where Active
International Institute of Cotton (IIC)	Honduras
International Labor Or. (ILO)	Haiti, Nepal, Togo
International Union for the Conservation of Nature	Sierra Leone
International Waterfowl Bureau	Paraquay
Irish Government	Lesotho
Italian Government	Tanzania
IUCN/WWF	Niger
Japan	Fiji
Japanese Volunteer Organization	Malawi, Nepal
Kenya Renewable Energy Development Project (KREDP)	Burundi
Kenyan Womens Group	Kenya
KFW (German)	Senegal
La Lecha League	Guatemala
Las Amigas Norteamericana	Paraquay
Libya	Niger
Lions Club	Cameroon, St. Kitts/Nevis
Local Radio Stations	Costa Rica
Mamee Magic Ltd.	Jamaica
MAP International	Ecuador
Meals for Millions	Ecuador, Sierra Leone
Medical Research Council	Gambia
Midwestern Universities Consortium for International Activities (MUCIA)	St. Kitts/Nevis
MISEREOR	Togo
Missouri Botanical Garden	Paraquay
Mission d'Etude	Cameroon
MTA-German Technical Mission	Paraquay
Myers, Fletcher and Gordon	Jamaica
National Center for Human Nutrition Planning	Zaire
National Commercial Bank	Jamaica
*National Extension Homemakers Council (NEHC)	Ecuador, Paraquay
National School For Applied Economics (ENEA)	Senegal
Netherlands Embassy	Philippines
New York Zoological Society	Burundi
New Zealand High Commission	Fiji, Solomon Islands
New Zealand Volunteer Service Abroad (VSA)	Western Samoa

Name of Organization	Countries where Active
Norwegian Government	Honduras
Norwegein Library Association	Sierra Leone
Organiz. American States (OAS)	Dominica, Honduras, Jamaica
OTA	Tonga
OXFAM	Zaire
Pan-American Ag. School	Honduras
*Pan-American Dev. Foundation	Belize, Barbados, Haiti, St. Kitts/Nevis
Pan-Pacific & South-east Asia Women's Association	Fiji
*Partners of the Americas	Costa Rica, Ecuador, Guatemala, Honduras
*Partnership for Productivity	Kenya, Jamaica, Liberia
Path-Finder Fund	Liberia
PC Partnership Plan	Lesotho, Nepal, Paraguay, Senegal, Sierra Leone, Togo
People to People Foundation	Honduras
PLAN	Mali
Plan en Honduras	Honduras
Plan International	Liberia, Sierra Leone
Plan Sierra	Dominican Rep.
PNUD/FAO	Niger
Private Parents Assoc.	Cameroon
Programa Mundial de Alimentacion	Honduras
Project HOPE	Jamaica
Project for People	Jamaica
Protestant and Catholic Missions	Zaire
Protestant Church Regional Training Group	Zaire
Purdue University	Niger
Quakers	Mali
Quote Club	Philippines
*Red Cross	Botswana, Fiji, Senegal, Tonga
Roman Catholic Missions	Botswana
Rotary Club	Cameroon, Ecuador, Guatemala, Philippines, St. Kitts/Nevis
Royal Bank Foundation	Jamaica
Salvation Army	Ghana
San Jose Bosco	Honduras
Save the Children	Cameroon, Gambia, Honduras, Kiribati, Philippines
SCF/USA	Nepal

Name of Organization	Countries where Active
Self-Help	Senegal
SEMRY	Cameroon
Service for Nutrition in Senegal (SANAN)	Senegal
SEVA Foundation	Ecuador
Shell Oil Company	Cameroon, Montserrat
SINAPS,PRINAPS	Guatemala
SNV	Nepal
South Pacific Regional Environmental Program	Western Samoa
Special Olympics Committee	Guatemala
SWANRU/ECZ	Zaire
Swedish International Development Authority (SIDA)	Jamaica
Swiss Government	Niger
Terres des Hommes	Senegal
*Trickle-Up	Costa Rica, Ecuador, Haiti, Paraguay, Senegal
Tufts University	Niger
UK Development Agency	Belize
UMN	Nepal
UN Agencies	Western Samoa
United Nations Development Programme (UNDP)	Belize, Barbados, Lesotho, Niger, Sierra Leone
UNDP/FAO	Kenya
UNDP/ILO	Cameroon
UNESCO	Haiti, Honduras, St. Kitts/Nevis
UNFPA	Fiji
UNICEF	Belize, Cameroon, CAR, Costa Rica, Fiji, Gambia, Guatemala, Honduras, Lesotho, Nepal, Paraquay, Senegal, Sierra Leone, St. Kitts/Nevis, Togo, Tunisia, Zaire
United Nations	Haiti, Paraguay, St. Lucia
United Nations Volunteers	Botswana, Haiti, Niger
UN Voluntary Fund	Jamaica
University of West Indies	St. Kitts/Nevis
USAID	Fiji, Lesotho, Zaire
USAID/PC SPA	Cameroon, Lesotho, Niger, Sierra Leone
USCC	Lesotho
US Embassy Self-Help Fund	Cameroon, Kenya

Name of Organization	Countries where Active
U.S. Universities	Ecuador
U.S. Women's Group	Costa Rica
USIS	Senegal, Sri Lanka
Vermont Partners	Honduras
VITA/Africare	CAR,
VSO	Malawi, Nepal, Sierra Leone
WFP	Nepal
Wildlife & Fisheries	Kenya
World Bank	Barbados, Burundi, Kenya, Mauritania, Nepal, Niger, Sierra Leone, St. Lucia
World Council of Credit Unions (WOCCU)	Paraquay
World Gospel Mission	Honduras
World Health Org. (WHO)	Fiji, Senegal
World Relief	Honduras
World University Service of Canada (WUSC)	Botswana
World Vision	Philippines
World Wildlife Fund	Costa Rica, Sierra Leone
YMCA	Fiji

ORGANIZATIONS COLLABORATING WITH PEACE CORPS IN TWO OR MORE COUNTRIES OF THE WORLD:

Name of Organization	Countries where Active
Action AID	Gambia, Kenya
Africare	Burkina Faso, CAR, Mali
Asia Foundation	Philippines, Western Samoa
Asian Development Bank (ADB)	Nepal, Western Samoa
°British Council	Botswana, Morocco, Senegal, Sri Lanka
British Development Division/ High Commission	Jamaica, Montserrat, St. Kitts/Nevis St. Lucia
°Canadian Embassy	Philippines, Senegal, Zaire
°Canadian International Dev. Agency (CIDA)	Barbados, Ghana, Nepal, St. Kitts/Nevis, St. Lucia
°Canadian University Service Overseas (CUSO)	Belize, Gambia, Sierra Leone, PNG
°CARE	Cameroon, Dominican Rep., Ecuador, Guatemala, Kenya, Lesotho, Mali, Nepal, Niger, Philippines, Sierra Leone
Caribbean Ag. Research & Development Institute (CARDI)	Dominica, Montserrat
Caribbean Development Bank	Belize, Montserrat, St. Kitts/Nevis St. Lucia
°Caritas	Guatemala, Honduras, Mauritania
°Catholic Relief Services (CRS)	Cameroon,Costa Rica, Dominican Rep., Ecuador, Gambia, Ghana, Lesotho, Mauritania, Paraguay, Philippines, Sierra Leone, Senegal, Togo, Zaire
°Church World Services	Niger, Seychelles
Cristoffel Blinden Mission	Malawi, Sierra Leone
°Dutch Foreign Aid	Mauritania, Nepal
°Dutch Volunteer Organization	Cameroon, Mali, Nepal
Embassy's Self-Help Funds	Cameroon, Lesotho, Sierra Leone
°European Development Fund (FED)	Burundi, Dominica, Togo
°European Economic Community	Belize, Barbados, Lesotho, Sierra Leone, St. Lucia
°Food & Agriculture Or. (FAO)	Barbados, Fiji, Honduras, Kenya, Nepal, Senegal, Sierra Leone
°Foster Parents	Ecuador, Honduras, Philippines
Foundation for Peoples of the South Pacific (FSP)	Fiji, PNG, Solomon Is., Tonga
French Volunteer Organization	Cameroon, Mali, Niger

* Indicates a Memorandum of Understanding exists between Peace Corps and the organization.

° Indicates the organization is active in more than one region.

Name of Organization	Countries where Active
°German Tech. Assistance (GTZ)	Sierra Leone, Sri Lanka, Western Samoa
°German Volunteer Service (GVS)	Botswana, Nepal
°Heifer Project International	Cameroon, Ecuador, Honduras, Zaire
Instituto Interamericano de Agricultural Dev. (IICA)	Dominica, Paraguay
*Inter-American Foundation	Belize, Costa Rica, Paraguay, St. Kitts/Nevis
International Human Assistance Program (IHAP)	PNG, Solomon Is. Philippines
°International Labor Or. (ILO)	Haiti, Nepal, Togo
°Japanese Volunteer Organization	Malawi, Nepal
°Lions Club	Cameroon, St. Kitts/Nevis
°Meals for Millions	Ecuador, Sierra Leone
*National Extension Homemakers Council (NEHC)	Ecuador, Paraguay
New Zealand High Commission	Fiji, Solomon Islands
Organiz. American States (OAS)	Dominica, Honduras, Jamaica
*Pan-American Dev. Foundation	Belize, Barbados, Haiti, St. Kitts/Nevis
*Partners of the Americas	Costa Rica, Ecuador, Guatemala, Honduras
*°Partnership for Productivity	Kenya, Jamaica, Liberia
°PC Partnership Plan	Lesotho, Nepal, Paraguay, Senegal, Sierra Leone, Togo
Plan International	Liberia, Sierra Leone
*°Red Cross	Botswana, Fiji, Senegal, Tonga
°Rotary Club	Cameroon, Ecuador, Guatemala, Philippines, St. Kitts/Nevis
°Save the Children	Cameroon, Gambia, Honduras, Kiribati, Philippines
°Shell Oil Company	Cameroon, Montserrat
*°Trickle-Up	Costa Rica, Ecuador, Haiti, Paraguay, Senegal
°United Nations Development Program (UNDP)	Belize, Barbados, Lesotho, Niger, Sierra Leone
UNESCO	Haiti, Honduras, St. Kitts/Nevis
°UNICEF	Belize, Cameroon, CAR, Costa Rica, Fiji, Gambia, Guatemala, Honduras, Lesotho, Nepal, Paraguay, Senegal, Sierra Leone, St. Kitts/Nevis, Togo, Tunisia, Zaire
United Nations	Haiti, Paraguay, St. Lucia
°United Nations Volunteers	Botswana, Haiti, Niger
°VSO	Malawi, Nepal, Sierra Leone
°World Bank	Barbados, Burundi, Kenya, Mauritania, Nepal, Niger, Sierra Leone, St. Lucia
°World Health Org. (WHO)	Fiji, Senegal
°World Wildlife Fund	Costa Rica, Sierra Leone

Miss **Schneider**. Well, the other thing that I can share with you is that I am working with Brown University to encourage them in their ongoing program in their school of public health, and their school of medicine is already very much involved in assisting Africa through student support, and they are trying to set up programs which would be comparable to a Peace Corps effort. So I will be happy to supply you with that information, too, and we can see how we can interface.

Mrs. **Ruppe**. Well, for instance, at Brown and at the University of North Carolina we are also looking at getting master's degree programs to encourage public health, the health skills we need. In agriculture, we would like to see scholarship programs set up, master's degree programs. That would also encourage minority Americans to serve in the Peace Corps we feel, which is a need that we see. We really would like to have every population in the United States represented in Peace Corps. Especially because not only overseas, but now we can see this reverse flow back to the United States that goes into the State Department, into AID, into the private voluntary organizations, international finance, and international agriculture. We would like all of America to be represented in that.

Thank you.

Mr. **Scheuer**. I would like Congressman Henry to introduce you properly, Mrs. Ruppe. And I am going to ask unanimous consent that his remarks introducing you be placed in the record immediately before the start of your testimony. OK? And then his remarks after that and any questions he may have will be placed after our colleague from Rhode Island's.

No objection, so ordered.

Mr. **Henry**. I did have several questions, and I am sorry that with conflicts I couldn't be present for all the testimony, however, I have read it. And as you are aware, this is one of a series of hearings on the hunger problem in Africa, and one of the things that I did want to ask you was, because it seems to me the Peace Corps has a role to play in response to this problem, if it is a problem. That recently there have been some statements in the Department of State and from USAID expressing some concern that the magnitude and now the constancy of our emergency famine relief in Africa may, in fact, unwittingly disrupt social patterns in such a way that undermines some of the agricultural self-sufficiency which may be in that continent. That is to say, that a pattern of dependency develops on famine relief which is potentially socially harmful because of the social dislocations, the movement around the distribution centers, and it makes more exasperating the problem of localized agricultural reform and enrichment. I am wondering whether you have heard this from your volunteers and what are your observations. Clearly it seems to me Peace Corps is an outstanding example of something which can forestall that development.

Mrs. **Ruppe**. Well, I would really like to call upon an expert who has just returned from Africa to address that because that is a very serious question you asking about development procedures. So could I ask John Zarofonetis, who has just come back from Mali, to head our African Food Systems Initiative, to answer this?

Mr. Zarofonetis. Yes, it certainly was very evident in Mali and in other countries under our Africa Food Systems Initiative that there is I think a fine cutoff when do you stop the aid or when do you phase it down. I think that our experiences with previous food crises, though, have always shown that the African farmer will return to the field.

Mr. Henry. OK. We haven't gotten to the point where you think we are doing damage. Obviously no one belittles the importance of emergency famine relief going on. But that problem is being voiced, and it is very important.

And you are saying that historically where we have been involved in family relief that kind of dislocation has not done structural, endemic problems to those relocated populations that it has made it harder to get them back into agriculture?

Mr. Zarofonetis. Not to my knowledge, but it is a consideration.

Mr. Henry. OK.

Mrs. Ruppe. And certainly I think AID is trying to and PVO's are trying to get the seeds and the instruments, and encouraging, in every way possible, villagers to return to their village. But the challenge is to send them back with the seed and the capability of really starting in agriculture once again.

Mr. Henry. The second question—and I have tried to pick through that—I think you have some unique insights on is the testimony by both Mr. Brown and Mr. Edelman talked about the tremendous localized variance of agricultural production in Africa which make it very different than Asia in terms of the different kinds of dietary and climatic, geographic influences, and also since the societies are less centrally organized and much more diverse, both of them emphasizing the need for more localized kinds of programs and pointing out that PVO's—and Peace Corps in many ways is modeled on many of the PVO's—have a uniquely adaptable role through this, and I am wondering whether that issue has been touched on in my absence or whether you would wish to comment on the unique characteristics of the Peace Corps in responding to those two needs that we heard about in the earlier testimony.

Mrs. Ruppe. Well, I would have to agree with you completely, we do have that unique capability. First of all, we have a proven track record in Africa. We have been there for over 20 to 25 years in most of the countries we are in. We have trained personnel who get information right from the village level as to what is needed.

In our African Food Systems Initiative that is why we are insisting upon the careful assessment prior to even committing volunteers. We are saying it has to be assessed, you know, every region is different. I mean, when people talk about the whole continent, they lose track of the incredible individuality of every country and its unique needs right within a country. So we are doing the assessment and the evaluation and targeting the needs that really will help promote food production. So that is a unique capacity that we have to respond. That we have learned.

Do you want to respond to that?

Mr. Zarofonetis. Yes. I think I would briefly add that it is very important that any response to the food crisis in Africa reflect the nature of the problem itself, that it is long term, multifaceted.

There is no cookie-cutter approach, and that focuses on the small farmer.

Mr. **Henry**. I heard the bell. I am afraid I am cut off.

Yes, go ahead.

Mrs. **Ruppe**. But one great need I see is that within that, I mean we are doing that country by country. I mean, determining where our volunteers should be. But at some point in time there must be an overall plan that has to be developed really by the continent itself, I think. They are working on this through the Organization of African Unity. They came up with more solid, long-term plans than ever. But there has to be an overall approach.

Where does America target its resources? They are limited. You know, where do the PVO's? We have got to coordinate and have a plan so that we have a vision that people can fit into it, so that we can really solve this problem. It is going to take very careful coordination and planning, long-term planning. Who is going to produce? Who isn't going to produce? Who is going to import? Who is going to export? Who is going to have different industries, rather than agriculture? Those are questions that are yet to be answered from everything I have observed. Hopefully, we are working on that.

Mr. **Henry**. Thank you. What I was trying to do was actually set you up for another area which I thought would be good—one of the problems with the Peace Corps, it is very hard to measure achievement. Because the kinds of things that volunteers do are not always quantifiable. And I think it is expressively marked where you have this intense localism, as in Africa, where you can have so many different tribal languages, customs, and literally village, rather than even regional or national, social organization. So everything is done differently at that local village level. Because it is done differently it is very hard to quantify. Because it is hard to know what to measure when you are seeking quantification.

We can talk about USAID distributing so much food, or we can talk about a university exchange program training so many graduates with exchange students coming to the land grant or agricultural colleges and coming back. But it is very, very hard to quantify when you are localized down to such an intensely pluralistic kind of society.

With the chairman's leave, one final question. I have asked this of witnesses in other panels.

Increasingly I am finding, whether it is literature that might be considered coming from conservative sources, or moderate, or liberal sources, increasing attention being given to the need to develop greater market-oriented economics in the agricultural sector in Africa. Because of the potential misunderstanding, particularly in the Third World where the issue of statism versus market-oriented economies are often perceived as part of the Cold War framework as to how societies are organized.

Has this created a problem? Does it reflect itself in the activities of the Peace Corps? Has there been a feeling expressed to you in your trips and review and oversight that should these economies become more market-oriented that that in fact would be a partial solution leading to improvement in agricultural self-sufficiency?

Mrs. RUPPE. Well, definitely. I mean unfortunately the absolute dropoff of food production on top of the oil crisis which hit Africa with such terrible impact really finally has convinced, I mean, the African nations that indeed they have to change their policy. So you see a great interest that I have seen in the last 4 or 5 years for volunteers with small business skills, that marketing is key, that incentives must be given to the small farmer. So even our limited resources are being targeted to the countries for the African Food Systems Initiative whose governments indeed are promoting incentives to the small farmers. There is no point in us sending limited numbers of volunteers into countries that are not going to give incentives to the small farmer. Because the small farmer of Africa is just like the small farmer of America; if there are no incentives, if there is no profit, they simply will not make that effort.

Would you agree with that, John?

Mr. ZAROFONETIS. Entirely.

Mr. HENRY. Well, thank you very much.

Mrs. RUPPE. Thank you.

Mr. HENRY. And thank you, Mr. Chairman.

Mr. SCHEUER. Well, thank you, Paul.

I should have mentioned that Paul was a graduate of the Peace Corps. I want to say what an enormous contribution Paul Henry has made to the work of this committee, and how highly respected he is in the Congress and with what great affection and respect and credibility he is held. Your testimony has been wonderful. We have admired what you have said and the way you have said it.

Mrs. RUPPE. Thank you.

Mr. SCHEUER. Congresswoman Claudine Schneider is still busting out all over with more questions and I have a few more. We will submit them in the mail. But we give you our hearty thanks for your testimony. You were most interesting and most thoughtful, and gave us great confidence that the Peace Corps is right on target. You have got 6,000 of the best ambassadors our country could possibly have.

Let me just also say a final word. I totally agree with you that there is no point in pouring good money into totally failing economic models. There isn't a socialist economic model in the world that has worked. When you visit a country like Tanzania where the people are lovely and where they want a decent life and so forth, it just is painful and tragic to see how pitiful the economic conditions are and to realize that it is almost an impossibility for that economy to improve and for food production to improve under the absolutely absurd and bizarre economic rules which their government has imposed upon them.

Mrs. RUPPE. You would be interested, Mr. Chairman, in knowing however that an American PVO has had a substantive effect on their agriculture production. Rodale really got their ministry of agricultural and president very interested in the appropriate types of compost heaping, of all sorts of different things, and Tanzania is now very interested. It was interesting the effect that an American PVO can have on agricultural production.

Thank you.

[The prepared statements of Dr. Smuckler and Mr. Stoel follow:]

Testimony Prepared For Hearings of The Subcommittee on
Natural Resources, Agriculture Research and Environment,
Committee on Science and Technology
U.S. House of Representatives

Dr. Ralph H. Smuckler

Dean of International Studies and Programs, Michigan State University and

Chairman, Board on Science and Technology, National Research Council

October 31, 1985

Thank you for the opportunity to express my views on the prospects for sustainable development in Africa to attack the problem of hunger. I come to the subject after many years of effort to assist developing countries as a Professor and Dean at Michigan State University, and one who has spent much time in developing countries and in Washington working with people and agencies concerned and involved with these problems.

There are many explanations offered as to why the brutal African famine which we have all witnessed on our TV screens has occurred this year. The drought was an immediate cause. But closely tied to it are contributing factors such as rapid population growth, inadequate attempts to increase food production, overgrazing of live stock, desertification and other ecological considerations, transport and distribution problems, lack of determined leadership, over-riding political unrest and military contests, administrative ineptness, and generally low productivity. In situations of great fragility, where so many survive at the margin of nutritional needs and are hungry even in good times, any of these problems can bring some segments of the population to the point of starvation. Famine is certainly not new in the world, nor in these parts of Africa. However, misery and suffering at the level we have witnessed this past year brings the problem of poverty and hunger to a clearly unacceptable level.

What can those who live in a world of plenty and find such human suffering to be intolerable do about it? My view which I wish to lay before you today is that while relief in mammoth amounts is necessary and appropriate during the emergency, the only remedy for the situation requires focus on long term development programs which will yield sustainable growth in productivity generally and food availability in particular. Such measures must have a long term perspective because the nature of the task--testing and adapting technology, training advanced manpower, building essential research and educational institutions—simply cannot yield full results quickly. While short term actions can yield some positive results, long term strategies to guide investment and development are clearly in order.

The attempts to bring improvement in food production and availability in Africa have not yet succeeded. They are not likely to be successful without taking fully into account the complexity of the African natural environment, the need for stimulating and finding African solutions, and the many-sided human factors which are crucial to a successful effort.

So far, many of those concerned with Africa have been convinced that transfer of existing technology to Africa is the solution. As overall per capita food production drops in Africa, as it has in recent years, few would continue to take such a stand.

What should be the main components of the effort to accomplish sustainable development in Africa? In my view, such an effort would place heavy emphasis on selective institution building and, secondly, on high level manpower development. Furthermore, it would create a capacity in Africa to use well science and technology appropriate to Africa and to generate new technology as needed, based on research and development activity in Africa. There are many things to be done over the short run which will have a positive effect and serve as steps toward real solutions. But along with short term activity, it is the long term, generational approach along these three lines--institution building, manpower development, and strengthening R&D capacity--that must be pursued by Africans and those aiding them. The three are interrelated, but each is an essential ingredient in a long term strategy.

Direct transfer of agricultural varieties and other technologies from the West have not worked well in Africa. This was the general conclusion reached by my colleague at Michigan State University, Agricultural Economics Professor Carl Eicher, after many years of observing and studying African agriculture. In a paper in 1984 prepared while he was a visiting scholar at the University of Zimbabwe, Eicher states:

> Unless one has a deep understanding of the complexity and diversity of African agriculture and a realistic assessment of Africa's presentday absorptive capacity, one is likely to overemphasize material (direct) technology transfer and underinvest in helping indigenous institutions expand their scientific capacity. Unfortunately, long term support for strengthening indigenous scientific capacity is receiving low priority by most African states and by donors who are, for the most part, locked into conservative three to five year project cycles. (International Technology Transfer and the African Farmer: Theory and Practice, May, 1984; mimeo, p. 24)

He goes on to urge a minimum 15 year time frame for development efforts, a view which I share. Stressing the importance of research as a part of the long term approach, he states:

> The major lesson that one draws from Africa's experience in importing technology is that national research services should not sit back and assume that the thirteen International Agricultural Research Centers and multinational seed, chemical, and machinery manufacturers will supply them with new technology that is appropriate to the needs of smallholders and pastoralists...African states should be encouraged to grasp the nettle of the need for a stepped up and consistent national research effort as a prerequisite for tapping the regional, continental and global agricultural research system. Unless the scientific capacity of national research services is strengthened, the full potential of technology transfer from the global agricultural research system unfortunately will not be realized. (p. 27)

Along the same line, the work of the National Research Council Board on Science and Technology for International Development (BOSTID) on Africa suggests that authorities generally agree that research is an important ingredient in finding solutions to African food problems. There is also general agreement that research institutions in Africa need strengthening. To quote from an NRC working paper prepared by Michael Dow, Associate Director for Studies of the BOSTID staff, in which he summarizes the views of experts:

> The most urgent need is for greater recognition of the value of agricultural research, and for its local planning and coordination, rather than the current process in which priorities are attracted by available funding, decisions are often taken or imposed by foreign experts, not articulated by local scientists. Research needs to be taken seriously by governments, its value recognized in helping national decision makers predict the consequences of alternative courses of action in what is, after all, the most important national economic activity.

Dow points to the general view that small farmer or smallholder agriculture must be considered the basis of future expansion of food production. To deal with African smallholders, one must take the African ecological setting carefully into account. He points out:

> Particularly on the highly weathered, poor quality lowland soils, where there is an intractable problem of maintaining adequate levels of fertility and field capacity for moisture in monoculture production, growing attention is being given to low-till or no-till agriculture (since herbicides are cheaper than fertilizer), alley cropping or intercropping with multipurpose tree crops that can improve microclimatic conditions for food crops (shade, humidity, windbreak, etc.), moisture regimes and nutrient cycling (through their deeper and more prolific root systems) and fodder and fuelwood production, in more complex and therefore site-specific farming systems.

The long term effort, in my view, must include development of African manpower which will be essential in the search for and adaptation of usable technology. High level manpower represents an essential ingredient in the expansion of another essential component—R&D capacity. To accomplish these two goals we must build on those institutions which are now in place and show promise of growth and we must help to build those national research institutions and programs which have a good start and can make a regional contribution.

Universities are a critically essential element in manpower development, and in creating a stronger research capacity. Selected universities of Africa, therefore, must receive attention so that they can play their roles effectively. They must be strengthened as a part of the long term effort because they are so central to realizing these development requisites.

I would stress a point made earlier. In view of the fragility of the African ecology, research in agricultural matters cannot be viewed in a vacuum. One reason direct technology transfer has not succeeded in Africa is that the setting is environmentally different from the West and cultural and societal factors vary. Michael Dow, referred to above, refers to site-specific farming systems. Any agricultural solution must be environmentally sound, not just productive in the short run. And rural productivity increase of any sort must be based on sound environmental considerations if it is to be sustainable. Thus, the R&D capacity of African countries in scientific fields related to the environment must also be strong.

The need for the transfer of environmental and related R&D appropriate to the needs of developing countries was identified as a major priority by the Developing Country Task Force convened by the Environmental and Energy Study Institute. The task force, made up of U.S. corporate, environmental and development leaders and Members of Congress, was established to identify actions the U.S. Congress could take to help developing countries better manage their resources for sustainable development. The recommendations identified by the task force are concrete, politically realistic and fiscally responsible.

I was pleased to be a member of this distinguished panel.

I believe that Gus Speth, the task force chair, briefed the Subcommittee on the recommendations contained in the task force report, A Congressional Agenda for Improved Resource and Environmental Management in the Third World: Helping Developing Countries Help Themselves, during his testimony on October 23.

We identified 13 recommendations, of which R&D transfer is one. They stress training and other initiatives to build local self-sufficiency and a shift away from big, capital-intensive projects toward smaller scale projects which efficiently use energy, water and other resources and which are economically sustainable. They are generally a set of process-oriented actions designed to build capacity and manpower within developing countries to enable them to make the difficult choices necessary to adequately manage their environment toward attaining sustained development. Together, the recommendations propose a new, more cost-effective, localized approach to development.

I would like to focus on the research and development recommendation developed by the task force. The task force specifically proposes that Congress direct the Agency for International Development to review and make recommendations for improving the transfer of environmental and related R&D appropriate to the needs of the developing world.

The AID study should address four points: (1) the existing means through which the United States transfers new knowledge on environmental, natural resource and related development issues and technologies to developing countries; (2) the applicability and relevance of U.S. R&D programs to meeting the goals of sound natural resource management and environmentally sustainable development; (3) current levels of knowledge and R&D in the developing countries in this area; and (4) the transfer of such knowledge and R&D among developing countries themselves. Encompassed within the third point would be an appraisal of R&D capacity including manpower and institutions.

The EESI task force concluded that a study was necessary to define existing R&D capacity and the "state of the art" in R&D transfer. Currently, we do not know the degree to which U.S.-generated R&D is relevant to the needs of developing coutries. Our best estimates place the level of world-wide R&D effort which is directly tied to problems in developing countries at less than 3% of the total. Nor do we know whether relevant R&D is being transferred in such a way as to be useful to decision-makers in the developing world. A study addressing these points and questions and making recommendations for improvement in the transfer process would make a major contribution toward the goal of helping developing nations, particularly those in Africa, improve their environmental and natural resource management capabilities thus contributing to prevention of the type of tragedy we have been witnessing.

The transfer of R&D capacity has been identified by many as an extremely cost-effective and necessary approach for sound environmental management in the developing world. African countries must have the capacity to judge, adapt, develop and use new technology appropriate to their needs.

All that the EESI Task Force report recommends about transfer of R&D capacity is applicable to the African setting and fits into the long term approach and strategy which I advocate. I urge the committee to support the proposed study. It is one of the simple, but truly significant first steps we can take to address the environmental and natural resource problems in Africa as they relate to the food shortage and famine. Such a review or study would be an important step toward building long term strategy for attaining sustainable development in many fields and areas, certainly including Africa.

To sum up, I have urged a long term commitment, a 15-20 year perspective, for addressing the food problems in Africa. Such an approach would include attention to agricultural scientific and technological manpower needs, strengthening institutions to train advanced manpower in these fields, and concerted attention to strengthening agricultural research through building up R&D capacity. Such moves should be accompanied by parallel and sustained efforts in environmentally related fields so that agricultural improvement can be sustained over the long run in the African setting.

Natural Resources Defense Council, Inc.

1350 NEW YORK AVENUE, N.W.
SUITE 300
WASHINGTON, D.C. 20005
202 783-7800

Western Office
25 KEARNY STREET
SAN FRANCISCO, CALIF. 94108
415 421-6561

New York Office
122 EAST 42ND STREET
NEW YORK, N.Y. 10168
212 949-0049

TESTIMONY OF THOMAS B. STOEL, JR.

DIRECTOR, NRDC INTERNATIONAL PROGRAM

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURAL RESEARCH

AND ENVIRONMENT OF THE

HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

October 31, 1985

I. INTRODUCTION

Mr. Chairman, I appreciate very much the opportunity to testify before this Committee concerning the relationships among climate, population, agricultural practices, and environmental degradation in sub-Saharan Africa, and the actions needed to achieve sustainable development. You are to be commended for your initiative in setting up these important hearings.

I am Thomas B. Stoel, Jr., Director of the International Program at the Natural Resources Defense Council (NRDC). NRDC is an environmental organization with about 50,000 members in every state and more than 20 foreign countries. Today, I am also testifying on behalf of the National Wildlife Federation, which has 4.5 million members and supporters; the National Audubon

New England Office: 830 BOSTON POST ROAD • SUDBURY, MA. 01776 • 617 237-0472
Public Lands Institute: 1720 RACE STREET • DENVER, CO. 80206 • 303 377-9740

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Society, which has more than 500,000 members; the Sierra Club, which has 370,000 members; and the Environmental Policy Institute, a national conservation organization specializing in agriculture, energy, and water.

All the groups which I represent have a strong interest in the health of the environment, not only in the United States but all over the world. They are deeply concerned about the tragic and growing crisis in Africa, a crisis which is due in large part to the deterioration of the natural resource base while human populations are growing at unprecedented rates.

II. NATURAL RESOURCES AND THE AFRICAN CRISIS

Africa is in the grip of a devastating famine, which has caused the deaths of perhaps 100,000 people and threatens the lives of millions more. This year the United States will provide hundreds of millions of dollars worth of food aid to prevent further starvation.

However, it is crucial to recognize that Africa's crisis is a long-term one, resulting to a very great extent from the interaction of resource, environmental, and population trends. Much more than food aid will be needed to put Africa on the road to a decent future.

In your previous hearings, you have heard much about the African crisis and its causes. Today, you have asked me to speak mainly about actions which Congress and the international community can take to promote sustainable development, and I intend to do so. However, I would like to summarize briefly the connection between the African crisis and population, resource, and environmental trends, because an understanding of this connection is essential to identifying the actions we must take.

A. Population

Human populations in Africa are increasing at explosive rates. The United Nations estimates that Africa's population, now about 550 million, will reach 1.5 billion by the year 2025, only 40 years from now. It is estimated that, before leveling off, Ethiopia's population will grow from about 45 million to 231 million, Nigeria's from about 100 million to 618 million, and so on. In 1983, the Economic Commission for Africa stated that "the historical trend scenario is almost a nightmare."

These population trends have great significance for efforts to achieve sustainable development. Among other things, growing populations will impose enormous stress on Africa's natural resource base, which is already under heavy pressure.

B. Natural Resources

Africans depend on nearby natural resources for the great majority of their daily needs. They obtain water directly from rivers, streams, or wells. About 90% of the people depend on fuelwood, animal dung, or crop residues for heating and cooking. Trees and shrubs also provide materials for shelter. Food supplies depend on productive soils.

The essence of the problem in Africa is that growing numbers of people -- perhaps a third of the total population -- live on arid lands where it is difficult at best to meet human needs. The drought and continuing degradation of the natural resource base, together with other factors, have caused agricultural production to fall short of the needs of the present population. The result has been the current, tragic famine.

Yet it is clear that Africa's problems are long-term ones. As we have seen, it is estimated that the human population will double in the next 20 years. And we are seeing continued, rapid degradation of the natural resource base, rather than the renewal which is needed.

Far more trees are harvested than are replanted; the area cleared of forests each year exceeds by 29 to 1 the area where trees are deliberately replanted. In the Sudan, the stock of trees has declined by 25% since 1965; current trends will reduce the stock to one-fourth of the original level by the year 2000.

Perhaps the most troublesome trend -- and one closely related to the famine -- is loss of soil productivity. Precise figures for the African continent are hard to come by, but it is known that little arable land remains uncultivated; that on sloping fields, soil erosion of 20-40 tons per acre is common; that as fuelwood becomes scarce, cow dung and crop residues are increasingly used for fuel rather than to renew the soil; that livestock numbers have nearly doubled since 1950; that in many areas livestock herds exceed the land's carrying capacity by 50-100%; and that per capita food production has actually declined in sub-Saharan Africa during the last decade.

In addition, drought and erosion are affecting water supplies. Wells dry up; rivers and streams that used to run year-round are choked by silt and no longer furnish water in the dry season.

Another African resource under threat is wild species of plants and animals. Many species are near extinction due to hunting, gathering, or habitat destruction. These wild species provide necessities of life for many Africans, in the form of "bushmeat," traditional medicines, and so on. They also constitute a genetic reservoir which is needed to improve and invigorate Africa's food crops (Ethiopia, for example, is a major center of crop genetic diversity), and meet the needs of people everywhere. One-fourth of all prescription drugs are derived from tropical forest species. Yet most African species have not even been tested for their medicinal potential, and many are on the verge of extinction.

III. NEEDED ACTIONS

A. Introduction

Mr. Chairman, in this part of my testimony, I will describe the steps we believe are necessary to achieve sustainable development in Africa, and then recommend actions by the Congress to make sure the United States plays its part.

I would begin by placing these recommendations in perspective. We are the world's richest nation. We are the political, economic, and military leader of the Western industrialized nations which possess most of the world's wealth and scientific talent. There is wide agreement that the long-term crisis in Africa cannot be solved without substantial external assistance. If the United States does not play a major part in providing these resources, it is likely that they will not be forthcoming. The consequences would be tragic beyond belief.

Some may ask why we should respond, whether there are United States interests which justify investments of this kind. This question deserves an answer. The most compelling reason why the United States should respond to the African crisis is simply that the American people care about the fate of the African people. This was dramatically demonstrated by the outpouring of concern for the victims of the famine, which led the United States to furnish hundreds of millions of dollars in emergency food aid during the last year.

We know this famine is not a one-time event; after all, the Sahel suffered an equally devastating famine in 1972-74. The facts I have already presented make it clear that the crisis is a long-term one. The demands for U.S. emergency aid will only rise if we address only the symptoms and not the root causes. Strictly in dollar terms, we will save money by investing in the long-term measures needed to ensure a sustainable future rather than pouring out billions in emergency aid.

We have other economic interests in Africa's future. By the year 2025, 1.5 billion people are likely to live in Africa, almost 20% of the planet's population. If these people are prospering, they will provide markets for American goods and supply products which we need. If they are on the edge of catastrophe, or have gone over the brink, they will be a massive burden.

We also have national security interests in Africa, as shown by recent events in Somalia, Ethiopia, Angola, Chad, and other countries. We rely on strategic minerals from Zaire, Zambia, Gabon, and other African nations. We will be more secure if Africa is prosperous and stable than if it is gripped by famine and unrest.

I must end this overview on a note of caution. No matter what efforts we make, we cannot expect quick, dramatic solutions to Africa's difficult problems. These problems can be solved, but only by years of effort. The Congress and the country must be willing to make long-term commitments and to wait patiently for the results.

B. Population Growth

1. Needed Actions

Development cannot be sustained unless human populations stabilize at levels where natural resource systems can provide the products required to meet human needs. The current explosive population growth in Africa is clearly unsustainable. Unless checked, it will nullify the gains to be expected from economic assistance.

Many African governments at last are recognizing the need for strong actions to slow population growth. They need advice and help.

The U.S. Agency for International Development has had by far the strongest bilateral program of population assistance. The UN Fund for Population Activities is the leading multilateral agency. Like other UN agencies, it depends heavily on U.S. contributions. The International Planned Parenthood Federation is the leading nongovernmental actor. Until recently, it too was heavily dependent on U.S. support, via U.S. AID. It seems obvious that a rational, effective response to the population crisis in Africa requires stepped-up efforts by these key agencies, since they are most capable of providing the needed assistance.

2. Recommendations to the Congress

Our first recommendation is that the Congress direct U.S. AID, in cooperation with UNFPA and IPPF, to establish a major population program in each African nation where there are high rates of population growth and where such a program is politically feasible, and appropriate the necessary funds. Second, we recommend that U.S. funding for UNFPA be maintained at a level equal to about one-fourth of UNFPA's total budget.

These recommendations are so clearly justified that they should be noncontroversial. Unfortunately, the recent tendency has been in the opposite direction. The Reagan Administration has done its best to cripple the efforts of all three of these key agencies, on a worldwide basis. The Congress too often has acquiesced.

These actions are baffling, since they are contrary to the long-term, economic, security, and humanitarian interests of our own country. In Africa, the consequence could be a tragedy beyond our imagination. We urge the Congress most strongly to take the actions we have recommended, which are plainly warranted and desperately needed.

C. Natural Resource Management

If Africa is to surmount its crisis, it is absolutely essential that the natural resource base be maintained and restored, for without a strong natural resource base Africa cannot have a strong rural economy. This will require actions at all levels -- local, national, and regional -- but especially at the local level. It will also require additional research.

1. Local Level

Needed Actions

Given the weakness of national governments, the lack of transport and communications systems, the need for careful management of fragile soils, and the existence of strong institutions at the village level, it seems evident that sustainable development in Africa must come mainly from the bottom up, not from the top down. Yet this principle has largely been ignored in African development assistance. Misguided, centralized, capital-intensive approaches have resulted in failure of rural development efforts and continued deterioration of the resource base.

Fortunately, the lesson is being learned. The Office of Technology Assessment, in its excellent December 1984 paper entitled "Africa Tomorrow," records an emerging consensus that "the technology most needed in sub-Saharan Africa should be low-risk, resource-conserving, small-scale, affordable (not capital intensive), locally produced and repaired, adapted to local labor availability, and consistent with traditional agricultural methods."

When applied to maintenance and restoration of the resource base, these criteria lead to the conclusion that sustainable rural development in Africa requires a multitude of local projects featuring agroforestry, small-scale farms and gardens, and other innovative agricultural methods (including energy and resource-conservation techniques and use of organic or regenerative methods where feasible); check dams and terraces and other erosion-control projects; tree planting for windbreaks, soil stabilization, or firewood; energy conservation and small-scale energy production to reduce consumption of firewood and animal wastes otherwise usable as fertilizer; and local family planning, health, education, and training efforts.

Common sense tells us, and experience confirms, that these local projects can only succeed when local people are involved at all stages of project identification, design, and management, and come to feel that the projects belong to them. The object of these projects must be to benefit local people by increasing the productivity of the resource base, and the people must be convinced that they will benefit. Yet this principle, too, is often forgotten. The commonly cited example in which outsiders promote tree planting efforts and then leave, whereupon the villagers' goats eat up all the young trees, is a graphic illustration.

There must be special efforts to involve and work with African women, who most often are the ones who actually labor in the fields. This will require persistence and sensitivity.

Commonly, the best way of administering local projects and involving local people is through local governmental organizations, such as village councils; through local nongovernmental organizations; or through U.S. private and voluntary organizations such as CARE, Africare, and others. A constant theme among aid agency personnel and others who have spent time on the ground in Africa is that projects administered by these types of organizations are the ones most likely to succeed. African development must build on this field experience, so that these projects are no longer isolated examples but the norm.

I would emphasize especially the role which must be played by indigenous African groups. Village institutions in Africa are still relatively strong. They must be involved in the identification, planning, and implementation of projects, and in their administration. Village people must be educated, trained, and otherwise prepared to carry on after external assistance comes to an end. There are also a growing number of national and provincial indigenous nongovernmental organizations. They are a tremendous resource, and must be consulted, involved, and strengthened. International nongovernmental organizations, such as the Nairobi-based Environment Liaison Centre and the International Union for Conservation of Nature and World Wildlife Fund, can play key roles as intermediaries.

At the other end of the scale from African village groups are the multilateral institutions involved in African development. Prominent actors at this level include the World Bank, the African Development Bank, the UN Food and Agriculture Organization, the UN Development Program, UNICEF, and the International Fund for Agricultural Development.

These institutions must play a major role in African development, because they have the ability to involve and coordinate other institutions and to move large amounts of money. However, their record is mixed. The World Bank has pursued misguided, top-down approaches to agricultural development, and has assisted in the unwise deforestation of coastal West Africa. The FAO has emphasized livestock development on arid and semi-arid lands which has had disastrous effects on fragile grasslands, permanently damaging their productivity and promoting desertification. In addition, the FAO has supported indiscrimate use of some of the most potent and long-lasting pesticides on unique and fragile ecosystems. Other multilateral institutions, notably UNICEF and IFAD, have had better records.

Recommendations to the Congress

U.S. AID has supported some efforts of the right kinds in Africa, notably fuelwood projects and local projects aimed at restoring the natural resource base, often administered by U.S. PVOs such as CARE and Africare. Yet these efforts appear to be dwindling due to budgetary pressures and competing priorities. The OTA notes in its "Africa Tomorrow" report that "[t]he proportion of bilateral development funding aimed at Africa has decreased recently ...."

This trend must be reversed if Africa is to have a sustainable future. The United States must fund in every nation where we have a bilateral aid program a multitude of local, small-scale projects to maintain and restore the productivity of the natural resource base. We must provide even more funding for these kinds of projects in the future, as absorptive capacity increases and we learn what approaches are most successful.

Fortunately, legislation to accomplish this is already at hand. H.R. 2782 was introduced last June by Rep. Benjamin Gilman. This bill is supported by all the groups I am representing today. It authorizes $75,000,000 in additional funds for U.S. AID to undertake exactly the kind of small-scale, participatory projects I have described. The bill now has about 40 sponsors. It should be enacted swiftly, with at least one key amendment: the addition of family planning and health care projects as permitted objectives of expenditure.

In the Senate, Sen. Kassebaum has introduced a bill, S. 1364, which is very similar except that it requires AID to reprogram funds rather than authorizing new money. It now has nine sponsors. We recommend that it be enacted with amendments authorizing new money and adding family planning and health care.

As a complement to the Gilman bill, there is an urgent need for U.S. AID to identify the capabilities of African nongovernmental organizations and to develop programs to work with and strengthen them. AID has authority to support indigenous NGOs, and has done so in Latin America. However, it has not even begun in Africa, where these organizations must play a vital role. The Congress should send a signal that it expects this work to start right away.

We believe that, under present circumstances, the United States and other donors should not provide increased funding for the World Bank, African Development Bank, and FAO to carry out on-the-ground rural development efforts (as opposed to institution-building, research, and structural adjustment in African economies). The Congress, through the House Banking Committee and both Appropriations Committees, and the Administration through the Treasury and State Departments, have been urging the multilateral banks to change their policies in favor of small-scale, participatory, environmentally sensitive projects. They have not been sufficiently responsive. The United States should not help these institutions pour more money down the rathole of misguided rural development unless they implement far-reaching reforms, and should use all its influence to bring about those reforms. Similarly, any additional U.S. funding for FAO's agricultural efforts in Africa must be linked to major changes in FAO's approach to livestock production, pesticide use, and other environmentally sensitive issues.

On the other hand, we favor increased U.S. support for IFAD and relevant efforts of UNICEF. These agencies have good track records. In particular, they seek to involve and respond to the needs of local people.

2. National Level

Needed Actions

Purely local actions will not be sufficient to maintain and restore the natural resource base. The local projects just described must be backed up by efforts at the national level to provide technical and other support and to strengthen the capacities of African nations to provide effective research and extension services in support of sustainable increases in food production. These efforts must include establishing or strengthening soil conservation and forestry services; providing seeds, seedlings, energy-efficient and resource-conserving devices, and other needed materials; training and educating local people; and creating financial mechanisms to furnish credit to small farmers.

There is also a need at the national level for planning; for coordination; for training; and for changes in counterproductive national policies, such as maintenance of artificially low prices for agricultural commodities which deprive farmers of incentives to increase production on fertile lands. However, the focus of these national actions should be to support and assist local people in taking the actions on the ground which will finally make a difference. Aid agencies and others who furnish support should ensure that national bureaucracies do not obstruct local efforts instead of supporting them.

More fundamentally, African national governments must come to grips -- and be assisted to come to grips -- with the environmental crisis they face. With appropriate technical assistance, each African nation should be encouraged to formulate a national strategy for maintaining and restoring its natural resource base.

Generally speaking, we do not believe there is much need in Africa for large-scale, mechanized agriculture, large dams, big irrigation schemes, or big power plants. Careful assessment of proposals for large projects of this kind usually will demonstrate that development goals -- including satisfaction of near-term human needs, maintenance of the resource base to meet long-term needs, and economic criteria -- can be better achieved through small-scale, decentralized efforts.

National programs and actions are required to conserve Africa's plant and animal species. There is a special need to identify on a regional basis, and protect through national and international actions, a network of representative ecosystems which will preserve living species to meet human needs now and in the future.

Recommendations to the Congress

H.R. 2782 would provide additional funds for materials, services, and institutions needed to support local projects. On this ground, too, we urge its swift passage. Institution-building and training are badly needed to help Africans manage their natural resources. U.S. AID has strengths in these areas, and the Agency should be directed and funded to step up its efforts even beyond what will be possible under the Gilman bill. AID also should assist -- and encourage other donors to assist -- African governments to formulate national strategies for maintaining and restoring the natural resource base.

U.S. funding through both bilateral and multilateral channels should be directed mainly toward the small-scale, decentralized projects described above, not large-scale, mechanized agriculture, large dams or irrigation schemes, or big power plants. We must heed the OTA's warning (in "Africa Tomorrow") that "U.S. assistance ... can result in major failures if it is based largely on western traditions: a high-technology, capital-intensive, profit-maximizing orientation."

Therefore, U.S. AID should not support large-scale, capital-intensive projects in Africa. And when such projects are proposed for support by multilateral agencies, the United States should ensure that they are subject to rigorous environmental, economic, and human needs assessments, and that smaller-scale alternatives are carefully examined. When large-scale proposals do not measure up, we should vote against them and persuade other donors to join us.

We have already recommended against additional funding for the multilateral banks and FAO for on-the-ground rural development until these institutions implement needed reforms. Until then, they should focus on institution-building, training, research, and structural adjustments in national economies. There is much for them to do in these areas.

The Congress should ensure that the United States uses its economic and political influence to lead African nations toward structural and policy reforms at the national level. There must be incentives for proper management of natural resources if Africa is to have a sustainable future.

There is also a need for congressional action to prevent extinction of valuble plant and animal species now under severe threat in Africa. The Congress should enact pending bills -- H.R. 2957 and 2958 and companion bills introduced by Senators Roth, Pell, and others -- requiring U.S. AID to step up efforts to conserve tropical forests and biological diversity. With the advice of the International Union for Conservation of Nature and World Wildlife Fund, AID should initiate projects to conserve species and habitats in many African countries. The Interior Department's Park Service and Fish and Wildlife Service should step up their assistance to counterpart agencies in Africa.

3. Regional Level

Needed Actions

Actions of donors and governments to achieve sustainable development must be coordinated at the regional level. Workable mechanisms should be established to share information about unmet needs, successful projects, appropriate technologies, and so forth. The OECD's Development Assistance Committee, the Permanent Interstate Committee for Drought Control in the Sahel, and the Club du Sahel can help. However, there may be a need for a new coordinating mechanism to coordinate and stimulate long-term assistance aimed at sustainable development. The UN Office of Emergency Operations for Africa is performing this function very capably with respect to emergency relief and rehabilitation, and might be a good model.

Recommendations to the Congress

The Congress should ensure that the U.S. Government plans and coordinates its own actions on a regional basis. It is shocking that even now there appears to be no overall U.S. plan for responding to the long-term crisis in Africa. Without such a plan, our country cannot identify priorities, make long-term commitments, and coordinate with African regional institutions and other donors.

The Congress should require that this planning process examine all the means by which the United States can bring about needed changes in Africa. The Congress and Executive Branch should look at ESF funds, PL 480 efforts, the Peace Corps, and other U.S. instruments, in addition to those already mentioned, and make sure all U.S. resources and leverage are being employed in the right way. They should assess carefully the mix between ESF and economic assistance funding for Africa. We believe this assessment will show that our real security needs would be served better by a higher proportion of economic assistance.

The Congress should make sure that our country is a leader in establishing international mechanisms for coordination and cooperation, and that these have the long-term perspective which is required. The United States should use its influence to strengthen the efforts of the UN Environment Program relating to Africa, and should contribute not less than $10 million a year to UNEP.

The Congress should commission a study of the effects of the International Monetary Fund on natural resources in Africa. It is widely alleged that IMF conditions intended to increase exports compel nations to "mine" renewable natural resources such as forests and soils. This is the exact opposite of what is needed.

4. Research

I am not an expert on research. However, it appears that the agricultural research establishment represented in the CGIAR institutions hasn't really come to grips with Africa. There is talk about a "Green Revolution" for Africa. But the essence of the Asian Green Revolution was development and dissemination of new crop strains which increased production on fertile, well-watered soils, in part through application of expensive, high-energy inputs by highly disciplined farmers.

Africa largely lacks fertile soils. Productivity of arid Africa's grains of preference, sorghum and millet, has nearly stood still. Research on African crops is needed, especially to develop major food crops which can be grown on an environmentally sound, sustainable basis in semi-arid areas. But if there is an African Green Revolution, it will look very different from the Asian one.

Short of major food crops, there is an urgent need for research to provide appropriate materials and techniques for local, small-scale projects of the kinds described previously. The need here is for highly practical, least-cost technologies. These may be overlooked by conventional research institutions.

There is also a strong need for better monitoring and data on environment and natural resource conditions. Remote sensing, aerial surveys, and ground investigations all are needed on a scale far beyond the efforts of the past. These findings must then be incorporated into development planning.

Recommendations to the Congress

This Committee should examine closely the recommendations of the OTA "Africa Tomorrow" report and those put forward at this hearing (including my own), and propose appropriate legislation.

D. Meeting the Costs

Some of our recommendations -- beginning with our highest priorities, the passage of H.R. 2782 and increased population assistance -- will cost money. But how can we possibly spend more on Africa in view of the budget deficit?

This question must be answered. At this time, I can present only some possibilities. First, as suggested above, the Congress should re-examine how we are now spending money in Africa. ESF or multilateral bank funds now going into ineffective boondoggles should be redirected to places where they it will make a real difference.

Second, we should ask how best to ensure our long-term security. Does it make sense to have a defense budget in excess of $300 billion and spend less than $500 million on economic assistance for a continent gripped by a severe and growing crisis? Wouldn't $1 billion less for "defense" and $1 billion more for long-term assistance to African nations buy us more security?

Third, we should not shrink from the possibility of raising more revenues. The American people gave tens of millions of dollars for African famine relief during the last year. They might favor, for example, a gasoline tax which raised $1 billion -- less than $10 from each American family -- a year to help desperately poor people in Africa achieve a sustainable future.

IV. SUMMARY OF RECOMMENDATIONS TO CONGRESS

In view of the length of this testimony, I will conclude by summarizing our recommendations for congressional action. We recommend that the Congress:

- Make clear in legislation the long-term U.S. commitment to ensuring sustainable development in Africa.
- Direct U.S. AID, in cooperation with UNFPA and IPPF, to establish a major population program in each African nation where there is a bilateral U.S. aid program.
- Beginning in FY 1987, make the UNFPA a separate line item in the international organizations and programs account, so funding can be assured at specified levels.
- Enact H.R. 2782 and S. 1364 with certain amendments, and appropriate $75,000,000.
- Direct U.S. AID to identify the capabilities of African nongovernmental organizations and develop programs to work with and strengthen them.
- Refuse to provide increased funding for on-the-ground rural development efforts by the World Bank, African Development Bank, and FAO unless they implement far-reaching reforms.
- Provide increased support for IFAD and relevant efforts of UNICEF.
- Direct AID to step up relevant institution-building and training efforts in Africa even beyond what will be possible under the Gilman bill, and provide the necessary funds.

- Direct U.S. AID to support small-scale, decentralized projects, not large-scale, mechanized agriculture; large dams or irrigation schemes; or big power plants.
- Direct the Treasury to ensure that when large-scale, capital-intensive projects in Africa are proposed for support by multilateral agencies, they are subjected to rigorous environmental, economic, and human needs assessments, and that small-scale alternatives are carefully examined; to make sure the United States votes against these proposals when they don't measure up; and to make efforts to persuade other donors to join us.
- Direct the Treasury to use the influence of the United States to focus the efforts of the multilateral banks on institution-building, training, research, and structural adjustments in national economies.
- Ensure that the United States uses its economic and political influence to lead African nations toward needed structural and policy reforms at the national level.
- Enact pending bills -- H.R. 2957 and 2958 and companion bills introduced by Sens. Roth, Pell, and others -- to protect biological diversity and tropical forests.
- Direct U.S. AID, with the advice of the International Union for Conservation of Nature and World Wildlife Fund, to initiate projects to conserve species and habitats in many African countries; and direct and fund

the Interior Department's National Park Service and Fish and Wildlife Service to step up their assistance to counterpart agencies in Africa.

- Direct the U.S. Government to plan and coordinate its own actions on a regional basis, and to prepare an overall U.S. plan for responding to the long-term crisis in Africa.
- Examine ESF funds, PL 480 efforts, the Peace Corps, and other U.S. instruments, and make sure all U.S. resources and leverage are being employed in the right way.
- Direct that the United States shall be a leader in establishing international mechanisms for coordination and cooperation aimed at sustainable development.
- Strengthen the efforts of the UN Environment Program relating to Africa, and provide a U.S. contribution to UNEP totalling at least $10 million per year.
- Provide adequate support for the African Development Foundation.
- Commission a study of the effects of the policies and procedures of the International Monetary Fund on natural resources in Africa.
- Examine closely the recommendations of the OTA "Africa Tomorrow" report concerning research, and those put forward at this hearing, and propose appropriate legislation.
- Redirect funds now being spent ineffectively under ESF or by the multilateral banks to places where they will make a real difference.
- Consider spending less for "defense" and substantially more for long-term economic assistance to Africa, in order to enhance our national security.
- Consider revenue measures to provide additional funds for sustainable development in Africa.

Mr. Scheuer. Thank you very, very much.

[Thereupon, the subcommittee was adjourned, to reconvene subject to the call of the Chair.]

APPENDIX

STATEMENT OF THE
AGENCY FOR INTERNATIONAL DEVELOPMENT
SUBMITTED FOR THE RECORD TO THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES
SEPTEMBER 19, 1985

Mr. Chairman and Members of the Subcommittee:

We welcome the opportunity to submit for the record an overview of the Agency for International Development's (A.I.D.) programs and international activities related to drought disaster and famine early warning, for the sub-Saharan African region. This testimony provides descriptions of A.I.D.'s role in designing, developing and implementing U.S. Government (USG) drought and famine early warning systems for Africa as well as a summary of our ongoing coordination activities both with other USG agencies and relevant international organizations. Early warning refers to increasing the lead time for food aid decision-making, while monitoring refers to the overall process of analyzing all available data.

Inasmuch as the Africa drought/famine monitoring effort has involved complex interactions among a variety of USG and international organizations, this testimony is organized into the following three sections in order to help clarify the roles, responsibilities and capabilities of the many providers and users of the information: (1) a summary of the A.I.D. and

USG interagency cooperative weather/crop monitoring systems for famine early warning to Africa, (2) a summary of international monitoring systems and related activities for Africa drought/famine early warning, and (3) a summary of A.I.D. and USG interagency coordinaton of climatic services and agricultural projections with other international organizations.

For the past two years, the drought in sub-Saharan Africa has been the most important single issue for A.I.D. During FY 1984/1985, total assistance for food and related emergency activities has exceeded $1.6 billion, and with further assistance in FY 1986, the total support devoted to food aid and emergency assistance in sub-Saharan Africa will be over $2.0 billion.

Although the emergency assistance necessitated by the drought covers many areas (refugee assistance, health, water, shelter, clothing, and recovery), the primary focus of our assistance is to sustain life through the provision of food. The cost of food assistance and transport for the period FY 1984-1986 will exceed $1.7 billion. Therefore, it is important that we have confidence in our ability to assess food aid needs, program food aid assistance, and deliver food to people in need.

The recent crisis in sub-Saharan Africa has garnered wide-spread public attention, and the report of the Keating Commission singled out food production and deficit information as a key component of the U.S. response to worldwide food needs. This task, although seemingly simple at first glance, becomes more and more complex upon examination.

Over the past two years, A.I.D.'s system for estimating and quantifying food aid requirements has significantly and steadily improved. We have also applied a number of lessons learned from the African famine of 1973. We have always utilized field data, host country reports channelled through international organizations as well as technologically generated data from U.S. agencies, but the need for better country-specific information necessitated improvements in the system.

One of the major reasons for this is that the extraordinary demands require that we make a good system better. Emergency food aid requirements in FY 1984 were three times the need for FY 1983, and the emergency needs for FY 1985 have been ten times the FY 1983 levels.

With the increasing evidence following the 1984 harvest that food shortfalls would greatly exceed initial projections made during the growing season, A.I.D. began to strengthen its assessment capabilities in order to mitigate the famine impact to the greatest extent possible.

This has proven to be a very important and timely undertaking. As the 1985 crop year crisis began to develop, we were ready with early warnings on the needs and estimates of food shortfalls that preceded actual harvests, and had follow-up assessment teams in the field making reports in the first quarter of FY 1985. This year, we are again in an excellent position to estimate crop yields, regional productivity, and potential food aid needs. Our approach is systematic and can provide three to six months' lead-time on food shortages, with reasonable estimates of crop yields some 30-60 days before harvest.

A.I.D. and USG Interagency Cooperative Weather/Crop Monitoring Systems for Famine Early Warning to African Nations

This systematic approach is made possible by A.I.D.'s Office of U.S. Foreign Disaster Assistance (OFDA) which has supported and managed the development and implementation of the National Oceanic and Atmospheric Administration's (NOAA) Operational Drought/Disaster Early Warning Program since its inception in 1979. This A.I.D. program is currently in place through a Participating Agency Service Agreement (PASA) with NOAA and will continue in operation under OFDA management through FY 1986. This activity is described in detail in the accompanying testimony presented before the Committee by Dr. Joan C. Hock, Director of the NOAA Assessment Information Services Center (AISC). We in A.I.D., both in Washington and our field missions, consider this operational program to be of real value in providing current as well as baseline historical information on crop conditions, rangeland conditions and weather-induced impacts on crop yields in the Sahel and Horn regions of Africa.

The Assessment Information and Services Center disseminates these special assessments routinely to more than fifty key USG interagency contacts, field missions and host country officials throughout the growing season. The NOAA system utilizes ground-based environmental information (such as rainfall station reports, and crop status), historical data and weather satellite imagery enhancements to quantitatively and qualitatively analyze current host country subsistence agriculture. This information is routinely factored into the USG food aid analysis and needs equation in order to arrive at host country food aid needs requirements. The system assesses impacts on agriculture due to weather factors only. The NOAA assessments are analyzed, adjusted and modified by our field missions and U.S. Department of Agriculture (USDA) country analysts to account for non-weather impacts such as disease, pests, price changes, policy considerations and other limiting factors.

A.I.D. and NOAA interact frequently on a daily basis to discuss food assessment information, current conditions, and potential impacts. Within A.I.D., OFDA cooperates in information exchange with the Office of Food for Peace (FVA/FFP); the Task Force for Africa Famine (TFAF), various technical, programming and country offices of the Bureau for Africa, and the Office of Science and Technology (S&T). OFDA is the liaison office for all NOAA/AISC activities, including coordinating Africa operational assessments, field surveys, training and technology transfer.

In addition to the NOAA program the A.I.D. Bureau for Africa, in cooperation with OFDA, the TFAF, the Department of State, and other agencies, has initiated in mid-1985 an activity called the "Famine Early Warning Systems (FEWS)." This effort has two principal thrusts: (1) the collection, analysis, and reporting of selected demographic and health data, constituting the "human side" of early warning needs, and (2) the development of a methodology to integrate early warning data from all sources (including NOAA, USDA, NASA, CDC, and A.I.D.

headquarters and overseas missions) and to process this information rapidly to identify specific geographic areas which appear to be most affected (most vulnerable or most susceptible) to drought-induced famine and disease, thereby maximizing response time for policy and program formulation as well as for emergency relief and rehabilitation actions.

The FEWS is set up to collect information from a variety of sources (e.g., the NOAA special assessments, A.I.D. mission field reports, Centers for Disease Control (CDC) and other medically oriented field reports, private and voluntary organizations, host governments, news media, and remote sensing technologies). These data are used to identify events, based primarily on analysis of changes in factors closely linked to vulnerability, in order to signal the evolution of processes which can lead to extraordinary famine and disease conditions. The FEWS information base includes data on demographics, weather, crop yield, crop production forecasts and estimates, food availability, transport networks and capacities, political conditions, physical/infrastructure, etc. These data are processed in Washington by several groups of individuals, using modern data processing and data analysis techniques, including a computer-based geographic information system. The products of FEWS include timely written assessments, vulnerability maps, and computer generated statistical and tabular data on famine-related impacts and indicators. Products from the FEWS system are shared with those decision-makers in A.I.D., USDA, NOAA, Department of State, National Security Council, Centers for Disease Control, and other organizations and governments, as appropriate. An important goal of FEWS is to develop the means to transfer its sophisticated and analytical capacity to host country institutions in Africa as rapidly as possible.

A.I.D.'s Office of Food for Peace has responsibility for representing A.I.D. on the Interagency Food Aid Analysis Working Group which is chaired by the U.S. Department of Agriculture, International Economics Division of the Economic Research Service. The Working Group was created by the President in the summer of 1984 to coordinate and improve interagency analysis of food aid needs and to integrate available early warning information into the decision-making process. The Working Group prepares the "Food Needs and Availabilities Report" (FNA) on a routine basis. This report is an integrated compilation of analytical food needs information generated by a variety of sources including A.I.D., NOAA and the USDA, and enables more timely action in order to avert famine.

A.I.D.'s Bureau for Food for Peace and Voluntary Assistance (FVA) has produced a manual to be used in early identification of potential food shortages and in quantifying the projected food deficit for individual countries. The manual emphasizes the use of existing country data and recommends various estimation techniques and methods that are appropriate given the availability of host country data. The methodology may be used equally by recipient governments or donors to estimate food deficits. This systematic approach will be of benefit in both the short and long term. The A.I.D. Bureau for Africa coordinates with the Food for Peace Office to provide the A.I.D. input into the USDA Food Needs and Availabilities report. In so doing, the Africa Bureau also prepares its own "Food Production/Deficit Information Report for Africa," which is compiled from information cabled from U.S.A.I.D. field missions and data gathered by A.I.D. field staff using the FVA-developed methodology. This report focuses on current crop year food requirements and, as it reports the most recent field information, it supplements the official USDA report. As mentioned earlier, the USDA food needs report is the official guide to determining USG food aid actions in an effort to mitigate famine.

To date, strong interagency coordination and cooperation is evident between and among various offices of NOAA, USDA, CDC, the Interagency Task Force on Africa Famine, the Interagency Food Aid Analysis Working Group, and A.I.D.

Interagency information exchange on weather, climate, crop conditions and food status is progressing well. Our accelerated efforts will continue throughout this growing season in Africa and we, in A.I.D., will endeavor to forge stronger linkages with other agencies and offices which can offer assistance in the operational weather/crop monitoring and early warning program area. We currently access ancillary information from the USDA Foreign Agriculture Service ,the National Aeronautics and Space Administration, the USDA World Agricultural Outlook Board, and the USDA Joint Agriculture/Weather Facility. We will need, however, to develop closer programmatic and operational ties in the future for identifying their specific early warning capabilities and for obtaining additional timely assessment products which may be available or that can be tailored to our needs.

International Monitoring Systems and Related Activities for Africa Drought/Famine Early Warning

The principal non-U.S. international crop condition analysis, food shortage monitoring and food stocks inventory system is operated by the Food and Agriculture Organization (FAO) of the United Nations. The FAO Global Information and Early Warning System on Food and Agriculture produces several major reporting documents: (1) Food Crops and Shortages (Special Report), (2) Food Situation in African Countries Affected by Emergencies, (3) The Food Outlook Report, and (4) Special Alerts. The main objectives of the FAO system are to monitor continuously the world food supply/demand conditions, to assist countries in taking appropriate mitigative actions and to identify countries or regions where serious food shortages and worsening nutritional conditions are imminent, so as to assess possible emergency food requirements. Some 98 governments participate in the FAO system, providing relevant information on a voluntary basis and accessing information as required.

Information flows into the FAO system from numerous sources such as A.I.D. field missions, other participating governments, FAO field representatives, technical experts, other U.N. organizations such as the World Meteorological Organization (WMO), the World Food Program (WFP), the Office of the U.N. Disaster Relief Coordination (UNDRO) and units within the FAO Headquarters such as the Agro-Meteorological Group of Crop and Grassland Service and the Locusts, Migratory Pests and Emergency Operations Group. A.I.D. utilizes the aforementioned FAO reports, in part, as verification of early warning information determined by NOAA, USDA, and other sources. Our experience to date shows that the FAO reports generally corroborate our more timely assessments of crop conditions in the field.

In addition to the FAO Global Information and Early Warning System, regional organizations such as the Regional Center for Remote Sensing in Ouagadougou, the Regional Remote Sensing Facility in Nairobi, and the Agro-Hydrological and Meteorological Institute (AGRHYMET) in Niamy, play an important role in improving knowledge concerning host country natural resources. These centers provide training to African scientists and technicians in remote sensing technology and make available assistance to users of the technology. Similarly, in the Southern Africa region the Southern African Development Co-ordination Conference (SADCC) Regional Food Security Program concentrates on monitoring crops and rangelands and developing intervention strategies to mitigate food shortages and maintain economic stability.

The United Nations Environmental Programme (UNEP) is the sole U.N. environmental organization. As such, UNEP manages the Global Environmental Monitoring System (GEMS) and monitors pilot projects on tropical deforestation, soils, rangelands and desertification. The focus is on longer term environmental degradation but relates directly to the vulnerability and viability of various regions in producing subsistence crops under marginal conditions. UNEP supports ongoing environmental, food-related, nutritional and meteorological data collection activities carried out by the FAO, WMO, and the World Health Organization (WHO), especially in the areas of human health, deforestation, and climate impacts.

The United Nations Development Program (UNDP) has recently established the Trust Fund to Combat Poverty and Hunger in Africa. The Office of Emergency Operations in Africa (OEOA) manages this program and is responsible for mobilizing and coordinating emergency famine relief from all sources to the drought-stricken African countries. An ongoing function of OEOA is to collect and analyze relevant food crop and related early warning information from all sources including the NOAA assessments and A.I.D. field mission reports in order to better coordinate overall emergency relief activities.

While the FAO is the principal international food crop monitoring agency, the World Meteorological Organization (WMO) is the worldwide meteorological or weather monitoring agency. The World Weather Watch program of the WMO collects and transmits, from national meteorological centers to regional and World Data Centers, all national weather station reports through the Global Telecommunications System (GTS). These data are the backbone of weather/crop early warning monitoring systems operated by the FAO and other donor countries, including the USG early warning program activities (NOAA, A.I.D., USDA).

We believe that the improvement of early warning systems both at the national and international levels, cannot be disassociated from the wider task of restoring or upgrading the national capacity of host countries to collect, interpret, and disseminate meteorological information, monitor crop growth, compile data on the food stock situation and detect and monitor other relevant social or economic indicators of food crises. Without successful development of national and regional capacities in Africa itself, no adequate overall early warning system is possible. Towards that end A.I.D. has collaborated with the Club du Sahel and the Permanent Inter-state Committee for Drought Control in the Sahelian Zone (CILSS) to continue reinforcement of the network for the prevention of food crises in the Sahel.

In May 1985, a special session of the CILSS Council of Ministers revised the formal mandate of the CILSS to include the need to "contribute to the coordination of emergency assistance in order to promote its use for development." The goal of the food crisis prevention network is to assist governments in avoiding famine based on quantitative assessment information. Famine mitigation or avoidance actions may be realized by the network in the future if measures required for delivery of appropriate levels and types of food aid to the Sahel are undertaken in a timely manner by donor nations. Another goal of the network is to minimize the cost of food aid supply.

Coordination of A.I.D. and USG Interagency Climatic Services and Agriculture Projection with Other International Organizations

A.I.D. coordinates directly with the FAO, CILSS, AGRHYMET, SADCC and UN/OEOA in the exchange of crop yield projections and crop forecast information on both national and regional levels. A.I.D. has continuing liaison with the World Food Program (WFP) in the assessment of food stocks, logistics and forecasts of food aid needs. A.I.D. financially supports AGRHYMET in conjunction with CILSS and other donors. NOAA's National Weather Service Overseas Operation Division (NWS) works on behalf of A.I.D. to upgrade the weather data collection and analyses system for the entire Sahel region at the AGRHYMET Regional Center in Niger. A.I.D. benefits from the WMO Global Telecommunications System and Global Weather Watch through interagency agreements with NOAA which directly accesses WMO weather information. A.I.D. continues to support the development of a comprehensive approach to early warning systems on famine by strengthening African institutional capabilities on the ground (i.e., crop statistics and rainfall station reporting) as well as through remote sensing technology applications. Toward that end, A.I.D. has continued to assist the FAO in transferring elements of the NOAA technology to host countries in Africa and is seeking additional ways to enhance African capabilities to monitor crop conditions, forecast climatic impacts and increase agricultural productivity.

A.I.D., in coordination with the USDA Foreign Agricultural Service (FAS) and their agricultural attaches in the field, works in cooperation with FAO resident representatives in-country and with UNEP and host country officials to monitor drought conditions and to forecast agricultural production. This information and data, in turn, are utilized to the greatest extent possible to maximize the lead-time required for food-aid decision-making and the mitigation of food shortages and famine impacts in the developing countries.

Clearances:
AID/AFR/TFAF:TMorse: PK date: 9/27 w/minor changes
AID/AFR/TR:TCatterson: PK date: 9/26
AID/AFR/TR:WTreyfors: PK date: 9/27 w/insert
AID/FVA/FFP:SFrench: phone date: 9/26 Rm. 211, SA-8
AID/AFR/DP:JHRadsky: PK date: 9/26 Rm. 2733-A
AID/AFR/DP:HMerrill: HM date: 9/26 Rm. 3919
AID/C:KScofield: (PHONE) date: 10/2/85 Rm. 5945
AID/PPC/PB:PRobinson: PK date: 9/30 Rm. 3847
AID/GC/LP:BLester: (PHONE) date: 10/1/85 Rm. 6881 (w/changes, p.9)
AID/LEG:BCook: (DRAFT) date: 10/1/85 Rm. 2895
AID/S&T:JSullivan: (PHONE) date: 9/30
AID/AFR/RA:VMahan PK date: 9/26 Rm. 4533
AID/AFR/SWA:DChandler:PK (phone) date: 9/30
AID/AFR/TR:KSherper: PK date: 9/30
OMB:GMoser (PHONE) date: 10/1/85

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MONITORING AND FORECASTING DROUGHT AND FAMINE

Prepared at the Request of the Committee on Science and Technology
of the U.S. House of Representatives

Charles E. Hanrahan, Specialist
Susan Epstein, Analyst —— 287-6678
Environment and Natural Resources Policy Division
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MONITORING AND FORECASTING DROUGHT AND FAMINE

Introduction

Widespread food shortages and human suffering in Sub-saharan Africa have focussed attention on the ability of U.S. Government agencies and international organizations to monitor and forecast drought and food emergencies. The capacity to monitor and accurately predict drought and food problems is a critical determinant of the nature, magnitude, and timeliness of responses to emergency situations. Some critics of the U.S. relief effort have argued that the deaths and suffering of uncounted Africans during 1984 and 1985 resulted from the failure of U.S. and global information systems to monitor and predict in a timely way the African drought and famine and thus slowed the U.S. response. Others argue that the United States and international organizations have a strong capacity to monitor and forecast drought and famine and that factors other than the strength or weakness of existing information systems to monitor and predict disasters slowed the response of the United States and other donors to the emergency in Africa. Because of such considerations, Congress has focussed its attention on the issue of U.S. and international cababilities to monitor and predict drought and food emergencies.

This report will identify and describe the U.S. Government agencies and international organizations that are involved in monitoring and forecasting drought and famine and describe the organizational units within each agency and the interagency linkages that make up the U.S.

Government's system for monitoring and forecasting world food supply and demand conditions. This section of the report will discuss the extent to which the agencies involved make use of advanced information technologies for monitoring and forecasting drought and famine. The report concludes with a discussion of the organizational and technological issues raised and the options that Congress may wish to consider for improving the capacity of U.S. and international capacity agencies to monitor and forecast drought and food emergencies.

U.S. Government Agencies Involved in Monitoring and Forecasting

A number of U.S. Government agencies have programs for monitoring and forecasting conditions that affect food supply and demand around the world. The primary agencies involved are the U.S. Department of Agriculture (USDA), the National Oceanographic and Atmospheric Administration (NOAA), and the U.S. Agency for International Development (AID).

U.S. Department of Agriculture

The U.S. Department of Agriculture is the main U.S. Government agency with responsibilities for monitoring, forecasting, and reporting on world food supply and demand conditions. USDA maintains both a national and a global system for developing, using and reporting data and information on world agriculture. In principle, USDA monitors drought and famine conditions worldwide as part of its overall program of monitoring and forecasting world food and agricultural supply and demand conditions. In practice, however, USDA gives priority attention to countries and regions of the world that are major commercial producers and exporters of agricultural commodities. Despite the overall priority given to foreign commercial agriculture, USDA, because it is one of the two main U.S. Government agencies with responsibility for administering the United States' foreign food aid programs, USDA does carry out monitoring and forecasting of agricultural supply and demand conditions in developing countries that are most prone to droughts, food shortages, and famine conditions.

The USDA national and global information systems are maintained in order to meet the information needs of such client groups as farmers, businesses, consumers, exporters and others in the private sector and of policy makers and program administrators within the USDA or in other Government agencies. For example, farmers may use USDA forecasts of prices or foreign crop conditions as a partial basis for determining the area to plant for the next season's crop or to make marketing decisions. USDA program administrators may use information on foreign crop supplies in determining the nature or scale of market development or export credit programs. USDA and the Agency for International Development (AID) may use information of food supplies in developing countries to make decisions about foreign food donations.

Within USDA, there are four main organizational units or agencies involved in monitoring and forecasting world food supply and demand conditions. These are the Foreign Agricultural Service (FAS), the Economic Research Service (ERS), the Statistical Reporting Service (SRS), and the World Agricultural Outlook Board (WAOB).

Foreign Agricultural Service. The FAS maintains a worldwide intelligence and reporting program to develop and disseminate information on world agricultural production and trade. The mainstay of FAS is the reporting by agricultural attaches in 76 posts throughout the world covering 105 countries. FAS analysts in Washington use the information gathered by attaches to develop estimates of current food and agricultural production and to forecast export potential for specific U.S. agricultural commodities or food products.

Gathering intelligence and reporting on agricultural and food supply conditions around the world is only one of the missions of FAS. In addition the information mission is geared primarily to support other FAS missions such as expanding foreign markets for U.S. agricultural products or administering agricultural export programs including P.L. 480, the Food for Peace program, which provides for the sale of agricultural commodities on a long-term credit basis and the donation of agricultural commodities to foreign governments, private voluntary organizations and the World Food Program. The information that FAS generates is also used in the formulation and coordination of U.S. Government agricultural trade policy.

Since the early 1970s, FAS has come to rely more heavily on computer aided analysis of satellite, meteorological, and related data in making its assessments of foreign crop conditions and expected production and trade. The main unit within FAS that uses satellite data is the Foreign Crop Condition Assessment Division (FCCAD). FCCAD uses remote sensing to make qualitative assessments of foreign crop conditions. FAS credits remote sensing with significantly improving the accuracy of crop estimates in the USSR, China, Australia, Brazil and Argentina. Satellite imagery has been particularly important in making estimates of USSR crops because of the lack of other reliable data on Soviet agriculture.

Beginning in 1981, FAS set up a high speed telecommunications network which allows FAS staff at foreign locations to create and transmit scheduled commodity reports to Washington. This system, the Global Economic Data Exchange System (GEDES), now provides over 75 percent of scheduled attache reports. GEDES generated information in summary form is also placed daily on a public access electronic network, thus giving same-day information to private sector users of the information.

FAS makes information available to the public in regularly published reports on commodity production and trade.

Economic Research Service. The Economic Research Service is another organizational unit within USDA that is part of USDA's global food and agricultural information system. ERS is an agency primarily responsible for economic research and anlaysis of factors underlying supply and demand for agricultural commodities and food products both domestically and internationally. ERS monitors domestic and foreign agricultural and economic activity and makes short-term and long-term forecasts of food and agricultural supply and demand. The International Economics Division of ERS analyzes foreign food supply and demand conditions. The work of this division focuses on research and analysis of economic relationships that influence food and agricultural production, consumption, prices and trade in and among the countries of the world. This division has prepared the annual report assessing world food production and needs that is mandated by Congress in P.L. 480. 1/

ERS does not have its own operational analytical capability to use directly satellite imagery in making its assessments of foreign crop conditions. Instead, ERS uses the assessments prepared by the Foreign Crop Condition

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1/ P.L. 480, the Agricultural Trade Development and Assirtance Act of 1954, Section 408b.

Assessment Division of FAS as well as the foreign weather information provided by the Joint (USDA-NOAA) Weather Facility maintained in USDA in making estimates of foreign country crop supplies.

In contrast to FAS, ERS analysts also make estimates of the global demand for agricultural commodities and food products. Included in ERS estimates of demand are estimates of food aid needed by people in in low-income developing countries. ERS uses data on income and population from U.S., international and individual country sources in making its assessments of foreign demand. In addition, ERS uses information on export earnings and foreign exchange reserves in making assessments of the capacity of countries to finance imports of agricultural commodities and food products.

Satellite data is less useful in demand assessment than it is in crop condition and supply prospects assessments. However, ERS does uses computer technology including microcomputers in its manipulation of large data sets on global and country supply and demand for agricultural commodities and food products.

ERS assessments of world, U.S. and foreign country agricultural conditions are made available regularly in published form as well as via public access computer networks.

Statistical Reporting Service. The primary responsibilities of the Statistical Reporting Service are to develop and disseminate national and state agricultural statistics and to conduct statistical research. SRS's main contributions to USDA's global food information system aside from its data on U.S. agriculture is the research it does to develop methods for using satellite data in making crop supply estimates.

Under the Large Area Crop Inventory Experiment (LACIE) and the Agricultural Resources Inventory Surveys through Aerospace Remote Sensing Research project (AgRISTARS) which used Landsat data, SRS developed and evaluated procedures using satellite imagery to monitor growing conditions on a world-wide basis and to relate data acquired through remote sensing to crop production variability. Within the Department of Agriculture, FAS has been the primary user and beneficiary of the results of this research. Outside the USDA, NOAA has refined and made extensive use of techniques for combining surface datawith satellite imagery to assess crop conditions.

SRS has also conducted research on improved methods for forecasting and estimating crop yields for both domestic and foreign application. The research involves the development of models which utilize relationships between crop yields and such environmental factors as weather, soils, incidence of disease, pests, and cropping practices. The models incorporate both surface and satellite data. Weather-crop models for the main grain producing regions for the USSR were developed and evaluated. These modesl are used in making forecasts and estimates of the annual Soviet grain crop.

SRS also provides technical assistance to developing countries on techniques for gathering and analyzing agricultural data under the auspices of AID.

· World Agricultural Outlook Board. The WAOB is the USDA agency with responsibility for review and clearance of all commodity and aggregate agricultural and food related estimates reported by the

USDA. The World Board has the responsibility for chairing all the interagency (within USDA) commodity estimates committees on which sit representatives of FAS, ERS, SRS, and the Agricultural Stabilization and Conservation Service (ASCS), the agency responsible for administering domestic price support programs. The World Board holds regular "lock-ups, that is, closed-door sessions, during which differences between agencies and analysts involved in making country and commodity agricultural and food assessments are worked out prior to making official reports. Agencies outside USDA with particular interest in the estimates under review participate in World Board procedures. For example, NOAA staff in the Joint Weather Facility (discussed below) participate regularly. in World Board "lock-ups"; the Central Intelligence Agency may be represented when Soviet grain estimates are under condsideration. AID has recently begun to participate in the World Board's review and clearance of the legislatively mandated global assessment of food needs and availabilities.

Within the USDA, the World Board has been assigned the responsibility of coordinating weather, climate and remote sensing research and forecasting and conducting cooperative activities in these areas with agencies outside the USDA. In this respect, the World Board and NOAA operate a Joint Weather Facility housed in the USDA complex in Washington. The JWF provides a daily review of significant weather developments around the world and their implications for agricultural and food production. The JWF publishes a weekly weather and crop bulletin highlighting developments around the world. The JWF conducts special briefings on the effects on agriculture of actual or potential weather developments.

NOAA

NOAA has responsibility for operating satellites and for developing and using applications of satellite technology. Combining imagery from its polar-orbiting and geostationary satellites with surface weather informatiohn NOAA can make agro-climatic assessments that provide early warnings of crop failure.2/ The organizational unit within NOAA that makes these assessments is the Assessment and Information Services Center (AISC) of NOAA's National Environmental Satellite, Data, and Information Service (NESDIS).

Much of NOAA's capability to combine satellite data with ground data resulted from the LACIE project and its successor AgRISTARS. These research projects, undertaken through a cooperative effort that involved the USDA, NASA, the Department of the Interior, and NOAA, contributed to the development of techniques for worldwide monitoring of the area and condition of major crops. Both these projects used Landsat data for crop identification and area measurements. Now NOAA uses AVHRR (Advanced Very High Resolution Radiometer) data from polar orbiting satellites to assess crop stress and drought conditions throughout the world.

AISC obtains its surface weather information in the form of rainfall estimates from the World Meteorological Organization (WMO) which has an extensive network for communicating weather information from its member countries which include many developing countries. According to NOAA, assessments of the status of agricultural production can be provided at least one month before the crop harvest.

2/ This discussion of NOAA's role in monitoring and forecasting is based on Joan C. Hock, Monitoring Environmental Resources through NOAA's Polar

NOAA currently provides AID with climatic assessments for countries in the Caribbean Basis, Africa, South and Southeast Asia, and Central and South America. NOAA provides AID with two products: (1) precipitation estimates and (2) color graphic displays for agricultural and vegetation monitoring. Satellite precipitation estimates help assess yield and harvest prospects. The vegetation index , used in combination with crop calendar information, provide quick visual aids in assessing crop conditions.

NOAA also conducts training programs in satellite applications for both AID and developing country personnel.

/ Orbiting Satellites, ITC Journal, 1984-4, pp. 263-268 and Use of NOAA Climatic Impact Assessment Technology by countries of the Sahel and Horn Regions of Africa for Operational Crop Monitoring and Range Management, PASA No. BOF-0000-P-CC-5099-00, AID July 1, 1985.

AID

The Agency for International Development is the U.S. government agency with primary responsibility for administering programs of foreign assistance in developing countries, including Title II of P.L. 480 and Section 416 of the Agricultural Act of 1949, both U.S. foreign food donation programs. Responsibility for administering the foreign food aid programs is shared by AID and USDA.

The Office of Foreign Disaster Assistance, the Bureau of Food for Peace, and the Africa Bureau are the main organizational units within AID currently involved in determining where food assistance is needed, what type of commodities would be appropriate, when timing of harvests or planting would prohibit food aid deliveries, and the logistics of distributing the food (i.e., port facilities, storage facilities, road or rail systems).

In order to administer the food aid program, AID requires timely and reliable information on what the needs are, as well as the crop conditions and weather for future plantings and harvests. This information comes from the NOAA/NESDIS/AISC satellite monitoring system made available to AID under a participating agency service agreement between AID and NOAA; from USDA's Congressionally mandated assessment of global food production and needs; and from reporting cables from the AID missions located in nearly every drought-affected or chronically food-short country in the developing world.

The NOAA agroclimatic assessments are made available to AID's Office of Foreign Disaster Assistance. The global food assessment prepared largely in USDA is provided under a participating agency service agreement to AID's Bureau of Food for Peace. Cable reports from the field on food needs in individual African countries are received in AID's Africa Bureau where they are totalled to give an estimate of the total food need estimate.

Currently, these information flows are coordinated by the Interagency Food Aid Analysis Working Group which was created in 1984 by President Reagan. The Working group is chaired by the U.S. Department of Agriculture's International Economics Division of the Economic Research Service. The purpose of the interagency group is to fostere cooperation among the agencies which work on foreign food aid issues, to obtain earlier warnings of drought and famine and to improve the food aid decision making process. This Working Group now assumes responsibility for the Food Needs and Availabilities report (FNA), the congressionally mandated report which was previously published solely by the USDA. The report, formerly an annual report, now is to include quarterly updates in order to improve the accuracy and timeliness of estimates of food needs in food-short countries.

Recent Developments in AID's Monitoring and Forecasting Activities

AID obtains most of its information on food supply and demand conditions in the developing countries, including information on drought and famines from external sources, e.g., USDA, NOAA, etc.

In 1979, AID began cooperating with NOAA in implementing a regional early warning system--the Operational Drought/Disaster Early Warning Program--in cooperation with the National Aeronautics and Space Administration (NASA), the Department of Defense (DOD) and the U.S. Geological Survey (USGS). While monitoring all types of disasters, this program includes the early warning of food shortages by providing a biweekly drought/crop condition assessment originating from NOAA satellite monitoring. This program provides information on crop, weather and rangeland conditions in the Sahel and Horn of Africa.

During the 1984/85 drought in Africa AID has begun to generate its own information on food supply and demand in countries that are most severely affected by drought. AID instituted field reporting by AID field mission personnel on the food situation, growing conditions, and weather in Africa. Africa Bureau personnel in Washington received this information from the missions, calculated local food availability and consumption needs, and determined the countries' commodity needs for supplemental food aid in the 1984/85 fiscal year. These estimates were used as a partial basis for the Administration's request for supplemental food aid appropriations for Africa for fiscal year 1985.

In mid-1985, the Agency for International Development announced the establishment of an early warning system for the forecasting of inadequate harvests and pending food shortages. This system evidently builds on and expands the existing AID-supported NOAA project for doing agroclimatic assessments and early warning of drought and food shortages. NOAA and AID will produce monthly reports for internal and interagency distribution containing analysis and forecasting of African rainfall, climate and crop conditions, as well as rangeland conditions.

International Organizations Involved in Monitoring and Forecasting

Two international organizations have programs for monitoring and forecasting conditions that affect food supply and demand around the world. These organizations are the United Nations Food and Agriculture Organization (FAO) and the World Meteorological Organization (WMO).

FAO

FAO's original function was to collect and disseminate agricultural information that member countries found useful. The organization now also carries out programs of development assistance in agriculture in the developing countries. Information gathering and dissemination remain, however, a primary responsibility of FAO.

The Global Information and Early Warning System on Food and Agriculture, established on the recommendations of the 1973 FAO Conference and the 1974 World Food Conference in Rome, is the main organizational unit within FAO that monitors and forecasts drought and famines.[3] The system has been in operation since 1975 and has two main objectives as stated in the World Food Conference resolution calling for the establishment of the GIEWS: (1) to monitor continuously the world supply/demand outlook for basic foods and fertilizers in order to assist governments to take quick action in changing the course of the situation; and (2) to identify individual countries and regions where serious food shortages are imminent, and assess possible emergency food requirements.

While all members of FAO are eligible to participate in the early warning system, currently about 98 countries, the European Community, and the Permanent Secretariat of the General Treaty on Central American Economic Integration (SIECA) actually do take part. Participation creates a two-way street: the participating country provides to the system on a voluntary basis raw data and ground information, while receiving the analysis and forecasting which is performed by the FAO professionals within the early warning system.

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[3] FAO, The Global Information and Early Warning System on Food and Agriculture, Rome, 1983.

Emphasis of the system is on cereals, however the system's monitoring is designed to cover the global supply and demand for all major food and feed commodities. Within individual countries, the system pays particular attention to the local staples including pulses, roots and tubers, as well as any livestock that may be significant to the local diet.

Monitoring is accomplished largely through the utilization of the European weather satellite system (METEOSAT) and the U.S. NOAA weather system. Analysis of the satellite imagery is combined with ground monitoring, as well as expertise and information from other international agencies such as the United Nations Disaster Relief Organization, World Health Organization World Meteorological Organization (WMO), and the International Wheat Council.

FAO maintains a representative and field staff in the vast majority of critical or potentially critical food-deficit countries throughout the world; and wherever there is no FAO Representative, quite often ground information is provided to FAO via the World Food Program advisors located in those areas. The FAO and WFP field staff reports regularly on the local food and crop situation as well as consumption needs. In many of these countries basic food supply/demand information is not compiled on a regular and systematic fashion by the local governments. Therefore, it has often been the case in the past that FAO or WFP field staffs were the only ones collecting and disseminating ground truth data on a historical and continual basis. The FAO representative sends out regular reports to the central unit within FAO; however, during a crisis or in the advent of a severe food shortage, the FAO representative telexes reports and frequent updates of the food supply/demand situation in that country or region, emphasizing early signs of crop failures, rainfall changes, lower than expected market produce, and signs of rising wholesale prices. Furthermore, the FAO field staff assists local governments in collecting and assessing food import needs.

Within each participating country the Early Warning System seeks to establish a local monitoring system to feed into the global system. The most seriously affected countries are usually the countries least able to develop an adequate system for monitoring and data collection. Therefore, particular attention is currently being given to improving national early warning systems.

The large volume and varying types of information accumulated within the Early Warning System is coordinated through the central unit, a small group of professionals who work within FAO's Commodity and Trade Division of the Economic and Social Policy Department. The central unit is responsible for organizing and analyzing the information that is provided by field staff of FAO and the World Food Program (WFP), and then coordinating it with the satellite information and information received from other FAO divisions as well as information from the other international agencies. This unit continuously assesses the world's supply and demand situation for the major food commodities by using the data and applying their knowledge of weather, production and consumption trends around the world.

Furthermore, the central unit is responsible for distributing information to the appropriate recipients.

The United States participates in FAO's Early Warning System as a member country of the United Nations and as a major contributor to the World Food Program which provides some funding for this program. In addition, the United States Department of Agriculture exchanges information with FAO on an informal basis, providing weather station data which supplements FAO's data.

Dissemination of information through the Early Warning System is accomplished through a number of reports. The Food Outlook report provides a monthly analysis of the global food situation, including prospects for production, stocks, exports, imports, food aid and prices. This report covers cereals, sugar, oilseeds, oils and fats, cassava, pulses, milk and milk products, meat and fertilizers. The Food Outlook Statistical Supplement covers similar aspects of global food issues, but with a longer time horizon; it provides historical data (1971 to 1981) and is updated annually. Foodcrops and Shortages is a monthly report which provides on a country-by-country basis the food supply and demand situation. This report identifies countries where crop conditions give cause for concern or where the conditions are critical. FAO issues Special Alerts whenever the food situation becomes especially threatening in a country or region. Alerts are telexed to potential donors so that quick action can be taken. Wherever sustained food shortages occur, FAO issues Special Reports. This has been the case with the continuing African famine when donor countries requested regular reports

on the food supply and import capabilities of the 26 most critically affected nations.

WMO

The World Meteorological Organization is the international organization responsible for performing weather and climate monitoring functions. Among the many activities of the WMO, three are of particular interest to the agencies monitoring world food/crop situations--WMO's World Weather Watch Program (WWW), their World Climate Program (WCP), and the Research and Development Program.

The World Weather Watch which was established in 1967 has a primary purpose of providing each national meteorological service with as much weather, climate or environmental -related information available. Three subsectors of the WWW are responsible for providing different aspects of weather information within WWW. The Global Observing System (GOS) provides information obtained through various forms of observations--on-ground weather stations, radar, aerial photography, and satellite imagery. The Global Data-Processing System (GDPS) provides processed information. The Global Telecommunications System (GTS) links all GDPS centers, providing rapid and accurate transfer of information throughout the world. The GTS exchanges raw data, observations, forecasts, analyses, and warnings. Both AID and USDA are recipients of the GTS information through their contracts with NOAA..

The World Climate Program (WCP), established in 1979, does research and education on climatic variability and change. Numerous international agencies are involved in this program, including FAO and United Nations Environmental Program (UNEP). This program performs research on a longer-term than WWW, observing long-term trends in climate changes. This information is available worldwide, complementing the food/crop monitoring agencies' shorter-term weather information.

3 /Worldmark Encyclopedia of the Nations, Worldmark Press, LTD., John Wiley & Sons, 1983.

WMO's Research and Development Program includes research on weather, climate, and other environmental factors in relation to agricultural production and development. Furthermore, the program facilitates the exchange and coordination of projects or findings.

AID, USDA, NOAA and FAO receive WMO information and use it in their respective monitoring and early warning programs.

ISSUES AND OPTIONS

This review of the role of various U.S. Government agencies in monitoring and forecasting drought and famine raises several organizational and technological issues. The organizational issues include questions relating to the need for individual agencies to improve their capacity to generate and/or use better the data available for monitoring and forecasting drought and food emergencies. Organizational issues concern also questions about interagency coordination and international coordination between the U.S. agencies involved and interntional organizations such as FAO and WMO.

The technological issues concern the operational capability of individual agencies involved to take advantage of advanced information technologies; the balance between research and development of information technologies and applications; and the state of the art with respect to the use of the most advanced and most appropriate information technologies.

A major issue is the capacity of developing countries to generate their own data for monitoring drought and famine.

Organizational Issues

Improving Agency Capacity. Each of the agencies with drought and famine monitoring and forecasting responsibilities carries out these responsibilities in support of agency programs. USDA monitors supply and demand conditions globally, among other reasons, in order to make decisions about food needs and availabilities as an input into preparation of the congressionally required report assessing food needs and availabilities. AID monitors drought and crop conditions and needs information about potential famines in order to carry out programs of emergency relief and disaster assistance. NOAA is responsible for both research and development and applications of satellite technology in drought and food emergency monitoring and forecasting.

A frequently cited concern with respect to both USDA and AID is the need for training of field staff in techniques for assessing crop conditions and estimating supply and demand for food and agricultural products. USDA's agricultural attaches are viewed by some as primarily promoters of U.S. agricultural exports rather than information analysts. Similarly, AID's field staff are viewed as primarily trained in project administration rather than crop condition assessment or methods for analyzing food supply and demand. Enhanced training and the opportunity to develop expertise in food supply and demand analysis in particular regions or individual countries are ways to strengthen both USDA and AID's monitoring and forecasting capability.

USDA's capacity to monitor and forecast drought and food problems in Sub-Saharan Africa and other low-income regions is constrained by the small number of agricultural attaches in those parts of the world. There are only three posts in Sub-Saharan Africa with agricultural attaches--Ivory Coast, Nigeria, and Kenya--however the attaches posted to those countries have responsibilities for monitoring and reporting on food and agricultural conditions in surrounding countries. For example, the attache posted to the Ivory Coast has reasponsibility for reporting on agricultural conditions in the Sahelian countries. Similarly, the attache in Nairobi, Kenya reports on conditions in other East and central African countries. The agricultural attache in Egypt has recently been assigned responsibility to monitor and report on agricultural condtions in Sudan, while the attache in South Africa reports not only on South African food and agriculte but also on developments in other southern African countries. Given that there are AID personnel in most of the countries in SubSaharan Africa affected by droughts, should USDA augment the number of attaches in the developing African countries or increase the frequency of reporting on agricultural conditions in those countries or should USDA rely instead on AID field staff for its information.

Interagency Coordination. The number of organizations both within U.S. Government agencies and across the Government raise issues of possible duplication of effort and the need for interagency coordination. There is already some duplication of work between USDA and AID for example in estimating food aid needs; there appears to be some duplication of effort between NOAA and USDA in relating surface weather information with satellite data and using these data to make crop condition assessments. However, USDA's use of satellite imagery for crop condition assesment (with input from NOAA) has focussed primarily on countries that are major producers and traders of grains and oilseeds; while AID (with NOAA's help) has focussed on crop conditions in the developing countries.

In the past, AID has relied heavily on USDA and NOAA for information on drought and food conditions. More recently AID has been increasing its own capacity to monitor and forecast drought and famine, mainly by introducing reporting from the field on food supply and demand conditions. To minimize duplication would it be desirable for AID to rely primarily or even exclusively on USDA and NOAA for its information on drought and famines in developing countries? If AID's program responsibilities,e.g., for emergency food relief or disaster assistance mean that it needs its own capacity to generate as well as use information on drought and famine, what does AID need to do to strengthen its monitoring and forecasting capacity.

The Administration has taken a number of steps to improve interagency coordination. The most imprtant appear to be AID ' participation with USDA in the preparation, review and clearance of quarterly reports to Congress on food needs and availabilities and the establishemnt of an interagency task force on food needs analysis chaired by USDA. A major concern of some observers is the prospect that the current enthusiasm for interagency cooperation and coordination will dissapate if and when the current food crisis in Africa fades from public attention.

A related issue is the degree to which organizational units within USDA and AID coordinate their monitoring and forecasting activities. USDA has a formal process for reviewing and clearing commodity and country/region food and agricultural supply and demand estimates before they are made public. AID has no formal procedure for making its estimates of food needs known to the public although it appears that the role of intra-agency coordination falls primarily to the Bureau of Food for Peace because of its program responsibility for food relief.

International Cooperation. There is by most accounts a fair amount of coordination in monitoring and forecasting work between U.S. Government representatives in the field, whether USDA or AID, and FAO field personnel. There is also informal cooperation between U.S. Government agencies involved in monitoring and forecasting the food situation in developing countries. The United States and FAO share information and have worked to resolve technical differences over procedures for making estimates of food supply and demand.

Practically no one has suggested that the United States rely exclusvely on FAO's Global Information and Early Warning System for estimates of food needs in countries affected by drought and famine. Because the United States supplies such a large proportion of the global total of food aid, including nearly one-half of the emergency food aid provided to Sub-Saharan Africa in 1984/85 and because of the dominant role of the United States in world agriculture, there is near universal agreement that the United States needs to maintain a global food and agriculture information system. However, FAO is an important source of information on food needs for most other bilateral food aid donors and for the World Food Program. Conflicting U.S. and FAO estimates of food need would unnecessarily complicate the response of the international community to food emergencies. Sharing information and technologies and resolving technical differences over procedures for estimating food supply and demand should enhance the response of the international community to food emergencies.

Technological Issues

While many of the issues concerning the capacity of the U. S. Government to monitor and forecast drought and famine are organizational in nature, there are also some technological issues. These include the existence of an operational analytical capacity within the agencies involved in doing the monitoring and making the forecasts of drought and famine; the balance between research and development of information technologies and the application of existing technologies; and the state of the art of information technologies used in monitoring and forecasting.

Operational capacity. The benefits in terms of improved monitoring and forecasting and more timely responses to food emergencies to be gained from advanced information technologies, i.e., satellite imagery and computer processing of satellite data, depends on the capacity of the agencies to access and use the data. Both NOAA and USDA make use of highspeed computers and sophisticated spreadsheet or other analytical software in processing and analyzing satellite and and surface data. AID relies primarily on NOAA rather than its own internal cabability to process and analyze satellite data. To the extent that AID decides to develop its own internal capacity to use satellite data rather than to contract for it with other government agencies, it may have to invest in both hardware and analytical software to provide itself with the requisite capacity. The role of training also important in developing operational capacity was discussed above.

Balance between Research and Development and Applications. The current state of the art with respect to monitoring and forecasting drought and famine resulted in large measure from larges-scale experiments undertaken during the early and mid-1970s—LACIE and AgRISTARS—jointly by USDA, NOAA, DOI, and NASA and other government agencies. These research efforts demonstrated the potential of combining satellite with surface data in making assessments of crop conditions in the United States and around the world. Currently most of the emphasis with respect to using satellite imagery is on applying the techniques that have been developed. While no one argues against using the currently available applications, some are urging more financial and personnel resources for research to further develop the existing and perhaps discover new methods for using advanced technology for monitoring and forecasting.

State of the Art Technology. As far as satellite technology is concerned, there is agreement among the agencies involvd--USDA, AID, and NOAA--that the best available satellite imagery is being used. FAO as well has access to essentially the same satellite generated data as do USDA and AID. USDA and NOAA computer facilities are probably superior to AID's but this does not pose an immediate problem for AID because it relies on these other agencies for much of its data and analysis.

The new technology of microcomputers with sophisticated spreadsheet capabilities, offers, according to some the possibility to improve the capacity of field staff of U.S. and international organizations as well as the capacity of the developing countries to analyze both surface data and satellite imagery. NOAA thinks that microcomputers will be particularly useful in conducting training of developing country personnel in techniques for monitoring and forecasting droughts and food emergencies. It appears that although a start has been made in some NOAA training programs, only limited use has been made of microcomputers and their capabilities.

Building Developing Country Capability to Monitor and Forecast

Probably the most serious obstacle to making improvements in monitoring and forecasting is the lack of capacity in many developing countries to collect and analyze data and report on their own food supply conditions and to make food needs assessments. More accurate data from the countries most likely to suffer from weather-related food shortages could lead to improvements in U.S. and international organization's information on drought and famine and could also result in more timely and adequate responses to emergencies. Improvements in national systems for monitoring and forecasting drought and famine would necessitate training, technical asistance and financial aid from both bilateral and multilateral sources. It would involve enhancing the capacity of developing countries to gather and analyze more conventional surface data on agriculture, including weather data, as well as developing their capacity to use advanced information technologies.

Testimony for
Hunger in Africa: Appropriate Technology

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a Hearing of the
Subcommittee on Natural Resources,
Agriculture Research and Environment

by

Robert Rodale
Chairman of Rodale Press and President of the Rodale Institute

Let me begin by saying that I'm very proud to submit this testimony on a subject of great concern to those of us at Rodale Press and the Rodale Institute.

A century is a short period in the 10,000-year history of agriculture. Yet in that brief time, the production of food for all the peoples of the world has switched dramatically from total reliance on the internal resources of farms to higher-yielding systems that are dependent on large amounts of external inputs. The chart on the next page graphically illustrates these two sets of resources.

The internal resources of agriculture -- as you can see -- are illustrated on the left side of the chart. And on the right are the external inputs that are often used in farming, especially in the highly developed countries. I should point out that on each side of the chart are illustrated not only the resources themselves, but also the mentality that accompanies the use of those resources.

RESOURCE SYSTEMS

FOR AGRICULTURAL PRODUCTION

INTERNAL	EXTERNAL
SOIL	HYDROPONIC MEDIUM
SUN - main source of energy	SUN - energy used as "catalyst" for conversion of fossil energy
RAIN - main moisture source	IRRIGATION - main moisture source
NITROGEN - collected from air and recycled	NITROGEN - primarily from synthetic fertilizer
MINERALS - released from soil reserves and recycled	MINERALS - mined, processed, and imported
WEED & PEST CONTROL - biological & mechanical	WEED & PEST CONTROL - with pesticides
ENERGY - some generated and collected on farm	ENERGY - dependence on fossil fuel
SEED - some produced on-farm	SEED - all purchased
MANAGEMENT DECISIONS - by farmer and community	MANAGEMENT DECISIONS - some provided by suppliers of inputs
ANIMALS - produced synergistically on farm	ANIMALS - feed lot production at separate location
CROPPING SYSTEM - rotations and diversity enhance value of all of above components	CROPPING SYSTEM - monocropping
VARIETIES OF PLANTS - thrive with lower moisture and fertility	VARIETIES OF PLANTS - need high input levels to thrive

While the change to reliance on large amounts of external inputs has enabled farms (especially in developed countries) to produce much larger amounts of food, I contend that it has distracted our attention from the enormous value and, indeed, the primacy of the internal resources of agriculture. And the systems using external inputs have done far more than merely cloud our vision of the value of internal farm resources. The inputs themselves often reduce the usefulness of a farm's internal resources.

Time and space don't permit discussion of each item on the chart, but let me explain, nitrogen an especially important resource. Protein production depends heavily on nitrogen. And around the world, nitrogen is the plant nutrient most often either lacking or limiting to increased production.

Yet we live in an atmosphere containing 78 per cent nitrogen. And there are several important ways that the liberal supply of nitrogen in the air can be captured and used by plants. Legumes do that effectively, in combination with special bacteria on their roots. And some microbes that live freely in the soil also can collect nitrogen from the air and make it available to plants.

Those nitrogen collecting systems -- as well as methods to recycle nitrogen within the farm -- can be extremely effective and low in cost. There are also ways to manufacture nitrogen synthetically and use it to substitute for the collection of nitrogen from the air. That approach to nitrogen supply is stated on the right side of the chart.

The contention of those of us now advocating regenerative farming systems is that the pendulum should start swinging back again toward internal resources. We are not against the use of all external inputs by agriculture. Far from it. But we are saying that farms in this country and overseas have tremendous regenerative capacity that can be expanded and put to good use as farmers learn to use their internal resources more effectively.

Annually, over 15,000 people from around the world visit the Rodale Institute's 305-acre research center where we conduct experiments and research in regenerative farming. The percent of foreign visitors to our research center has increased dramatically in the last few years, demonstrating the marked growth of interest -- and the need for more assistance -- in the Third World in food production techniques that do not depend solely upon expensive irrigation, chemical fertilizers and pesticides, and extravagant farm machinery.

The interest of these foreign agronomists, scientists, and government leaders in regenerative farming is so great because they see it as a method of farming that makes sophisticated and efficient use of resources right on the farm, not ten or ten thousand miles away. And they like it because it is not a new system, no Green Revolution package, not a team of regenerative scientists going into their countries to show peasant farmers modern techniques. Rather, our regenerative farming program is a program of capacity building -- of showing people in less developed countries how to help themselves.

We have been encouraged by the response the Rodale Institute has gotten this last year. Our visitors have included people from the African section of the United Nations Development Program, 25 staffers from USAID, and a team of West African leaders in collaboration with the World Bank. We are looking forward to conducting a workshop in early December at USAID World Headquarters for 90 AID mission, Peace Corps, PVO, and university personnel on the potential applications of regenerative agriculture to developing countries, especially those in sub-Saharan Africa.

But much more needs to be done. USAID, the World Bank, and other leaders in development aid must revise their programs to put less emphasis on bringing resources into developing countries and put more emphasis upon helping people there rediscover and better use the resources that are there already.

They need to support more small-scale producers, gardeners, herders and livestock raisers, functioning as individual small holders and/or members of cooperatives. They need to support the growing of indigenous foods. And they need to support gardening and farming methods that have worked for thousands of years and that could now work even better, with the help of advances in intercropping, rotations, overseeding, weed and pest control, and other techniques that are at the core of regenerative farming.

WRITTEN STATEMENT OF THE HONORABLE MICKEY LELAND

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURAL RESEARCH AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

OCTOBER 31, 1985

MR. CHAIRMAN, THANK YOU FOR GIVING ME THE OPPORTUNITY TO SUBMIT MY WRITTEN TESTIMONY EXPRESSING MY INTEREST IN AND CONCERN ABOUT THE IMPORTANT ISSUES YOUR DISTINGUISHED SUBCOMMITTEE WILL BE ADDRESSING TODAY. AS CHAIRMAN OF THE SELECT COMMITTEE ON HUNGER, I AM PARTICULARLY INTERESTED IN THE SUBCOMMITTEE'S RESEARCH ON THIRD-WORLD AGRICULTURAL NEEDS, ENVIRONMENTAL DECLINE IN SUB-SAHARAN AFRICA AND THE TRANSFER OF APPROPRIATE AGRICULTURAL TECHNOLOGY TO HELP LOW-RESOURCE FARMERS PRODUCE MORE FOOD.

SINCE ITS INCEPTION, THE SELECT COMMITTEE ON HUNGER HAS BEEN INVESTIGATING MECHANISMS FOR INCREASING FOOD PRODUCTION IN DROUGHT-AFFECTED SUB-SAHARAN AFRICA WITH A FOCUS ON INCREASING

LOW-RESOURCE FARMERS AND HERDERS' PRODUCTION CAPABILITIES. RESEARCH HAS SHOWN THAT TARGETING APPROPRIATE AGRICULTURAL ASSISTANCE TO LOW-RESOURCE PRODUCERS WILL PROVIDE SIGNIFICANT INCREASES IN LOCAL FOOD PRODUCTION THAT CAN IN TURN HELP FEED AFRICA'S GROWING POPULATION.

THE OFFICE OF TECHNOLOGY ASSESSMENT HAS FOUND THAT LOW-RESOURCE FARMERS NEED TECHNOLOGIES THAT ARE AFFORDABLE, LOW RISK, RESOURCE-CONSERVING, SMALL SCALE, ADAPTABLE TO LOCAL LABOR CONDITIONS, CONSISTENT WITH TRADITIONAL AGRICULTURAL METHODS, AND THAT ARE LOCALLY PRODUCED, MANAGED AND REPAIRED. TECHNOLOGIES WITHOUT THESE COMPONENTS WILL BE OF NO ASSISTANCE IN HELPING TO INCREASE THE FOOD PRODUCTION OF LOW-RESOURCE FARMERS. THERE HAVE BEEN MANY ATTEMPTS TO USE WESTERN AGRICULTURAL TECHNOLOGY TO HELP INCREASE AFRICA'S AGRICULTURAL PRODUCTIVITY WITH NO SUCCESS. IT IS FOR THIS REASON THAT THE CONGRESS MUST ADDRESS THE FOOD PRODUCTION PROBLEMS FACED IN AFRICA TODAY AND FIND WAYS THAT THE U.S. CAN APPROPRIATELY ASSIST AFRICA'S LOW-RESOURCE FARMERS TO PRODUCE MORE FOOD IN THE MIDST OF SEVERE ENVIRONMENTAL PRESSURES. THE SELECT COMMITTEE ON HUNGER HAS COMMISSIONED A STUDY BY THE OFFICE OF TECHNOLOGY ASSESSMENT TO TAKE A CLOSER LOOK AT LOW-RESOURCE FARMERS AND THEIR NEEDS. WE ANTICIPATE THIS STUDY WILL BE COMPLETED AROUND SEPTEMBER OF NEXT YEAR AND HOPE THAT IT WILL MAKE A VALUABLE CONTRIBUTION IN THIS AREA.

IN ADDITION, THE SELECT COMMITTEE ON HUNGER IS INTERESTED IN THE SUBCOMMITTEE'S RESEARCH ON THE ROLE OF WOMEN IN FOOD

PRODUCTION. WOMEN CONTRIBUTE UP TO FOUR-FIFTHS OF THE LABOR AND MANAGEMENT FOR THE PRODUCTION OF FOOD CROPS IN AFRICA. DESPITE INTERNATIONAL RECOGNITION OF THEIR IMPORTANCE TO AFRICA'S FOOD PRODUCTION, WOMEN RECEIVE FEW SERVICES THAT ASSIST THEM IN INCREASING THEIR FOOD PRODUCTION. BECAUSE WOMEN REPRESENT SOME OF THE MOST OVERWORKED AND LEAST SUPPORTED, AND IN MOST CASES, THE POOREST OF AFRICA'S RURAL POPULATION, IT IS VITALLY IMPORTANT THAT WE PROVIDE ASSISTANCE TO WOMEN TO HELP THEM INCREASE THEIR FOOD PRODUCTION CAPACITY. BY INCREASING THEIR ACCESS TO EXTENSION SERVICES, AFRICAN WOMEN WILL BE BETTER ABLE TO LEARN THE KIND OF TECHNIQUES NECESSARY TO INCREASE THEIR FOOD CROP YIELDS. WOMEN NEED ACCESS TO RELIABLE CREDIT, LAND RIGHTS, AND TRAINING IN FOOD PRODUCTION TECHNOLOGIES THAT ARE GENERALLY ONLY AVAILABLE TO MEN. IT IS IMPORTANT THAT THE CONGRESS ADVOCATE WITH A MUCH LOUDER VOICE THE IMPORTANCE OF INTEGRATING WOMEN IN APPROPRIATE AGRICULTURAL TECHNOLOGY TRANSFER AND THAT WE BEGIN TO TAKE THE NECESSARY STEPS TO ENSURE THAT AGRICULTURAL EXTENSION SERVICES AND TRAINING ARE AVAILABLE TO THESE VITALLY IMPORTANT FOOD PRODUCERS.

WHILE THE GREATEST BENEFITS IN TERMS OF INCREASING AFRICA'S OVERALL FOOD PRODUCTION LIE WITH APPROPRIATE ASSISTANCE TO FARMERS, THE SELECT COMMITTEE ON HUNGER HAS BEEN INVOLVED IN INCREASING THE AMOUNT OF FOOD AND THE LEVEL OF NUTRITION AVAILABLE TO THE POOREST OF THE POOR. IT IS WITH THIS CONCERN, THAT I WANT TO EMPHASIZE TO THIS SUBCOMMITTEE OUR INTEREST IN PROMOTING FAMILY FOOD PRODUCTION AND HOME GARDENING PROGRAMS TO

MEET MANY OF THE DIETARY NEEDS OF THE POOR. HOME GARDENS PROVIDE: MUCH NEEDED CALORIES TO THE UNDERNOURISHED; UPGRADED DIETS TO INCLUDE PROTEINS, MINERALS AND VITAMINS; A VITAL SOURCE OF FOOD-INTAKE BETWEEN HARVESTS OR WHEN HARVESTS FAIL; A NEW SOURCE OF FAMILY EARNINGS OR A NEW WAY TO REDUCE HOUSEHOLD FOOD EXPENDITURES MAKING FAMILY INCOME AVAILABLE FOR NEW ENTERPRISES; AND ALTERNATIVES TO OUT-MIGRATION AND DEPENDENCE ON TRADERS DURING TRADITIONAL "HUNGRY SEASONS". IN ADDITION, SMALL PLOT GARDENS CAN SERVE AS EXPERIMENTAL PLOTS FOR THE AT-RISK FARMER WHO CAN TEST SEED VARIETIES OF CORN, CASSAVAS AND OTHER FRUITS AND VEGETABLES BEFORE COMMITING SCARCE RESOURCES TO LARGER FIELDS. UNFORTUNATELY, THERE HAS BEEN LITTLE RESEARCH AND FIELD IMPLEMENTATION DONE OF SMALL PLOT AND HOME GARDENING PROGRAMS.

MEMBERS OF THE SELECT COMMITTEE ON HUNGER HAVE RECENTLY INTRODUCED LEGISLATION THAT PROVIDES ADDITIONAL FUNDS FOR THE EXPANSION AND PROMOTION OF VITAMIN A ACTIVITIES WITHIN THE AGRICULTURE, RESEARCH AND NUTRITION ACCOUNT OF THE AGENCY FOR INTERNATIONAL DEVELOPMENT. THE LEGISLATION SPECIFIES THAT VITAMIN A ACTIVITIES INCLUDE LONG-TERM EFFORTS TO PROMOTE VITAMIN A ENRICHED FOODS THROUGH HOME GARDENING PROGRAMS IN DEVELOPING COUNTRIES. THIS IS A FIRST STEP TOWARDS THE EXPANSION OF THESE TYPES OF PROGRAMS, HOWEVER, MUCH MORE NEEDS TO BE DONE.

THE IMPORTANCE OF LIVESTOCK TO THE INCOME OF LOW-RESOURCE FARMERS AND HERDERS AND TO AFRICA'S FOOD PRODUCTION CAN NOT BE OVERLOOKED. IN THIRD-WORLD COUNTRIES, FARMERS RELY ON ANIMALS

FOR NEARLY ALL ASPECTS OF AGRICULTURAL PRODUCTION. ANIMALS ARE USED FOR TILLING, PULLING THRESHING SLEDS, TRANSPORTING AGRICULTURAL SUPPLIES AND HARVESTS, AND OPERATING IRRIGATION DEVICES. NOMADIC HERDERS ARE ALSO DEPENDENT ON INCOME GENERATED FROM CATTLE AND MANY LIVE OFF THE MILK THEIR ANIMALS PRODUCE. CATTLE AND OTHER LIVESTOCK, INCLUDING SHEEP, GOATS AND CAMELS ARE RELIED UPON BY NOMADIC PEOPLE TO PRODUCE ALMOST EVERYTHING THEY NEED TO SURVIVE.

LIVESTOCK IS THREATENED IN AFRICA BECAUSE OF THE LACK OF VACCINES TO CONTROL A VARIETY OF DISEASES INCLUDING SLEEPING SICKNESS, SPREAD BY THE TSETSE FLY, AND EAST COAST FEVER, A PROTOZOAN PARASITE SPREAD BY TICKS. DISTRIBUTION AND ADEQUATE STORAGE REMAIN MAJOR OBSTACLES TO VACCINE INTERVENTION PROGRAMS. IN ADDITION, SINCE CATTLE ARE PREDOMINANTLY USED BY NOMADIC PEOPLE, AGRICULTURAL TECHNICIANS FIND IT DIFFICULT TO FIND AND THEN MONITOR AFFECTED OR POTENTIALLY AFFECTED CATTLE.

IT IS IMPORTANT THAT CONGRESS CONTINUE TO SUPPORT PROGRAMS AIMED AT PROVIDING THE NECESSARY VACCINES AND EXTENSION SERVICES TO SUPPORT THE NEEDS OF FARMERS AND HERDERS DEPENDENT ON LIVESTOCK. OVERGRAZING HAS CONTRIBUTED TO MANY OF AFRICA'S SEVERE ENVIRONMENTAL PRESSURES, THEREFORE IT IS CRITICAL THAT THE U.S. GOVERNMENT CONTINUE TO PROMOTE WAYS TO HELP SUSTAIN LIVESTOCK AND ALTERNATIVES TO CURRENT GRAZING PRACTICES.

APPROPRIATE TECHNICAL ASSISTANCE TO LOW-RESOURCE FARMERS, WITH A GREATER PRIORITY ON WOMEN, PROMOTION OF SMALL PLOT AND HOME GARDENING FOOD PRODUCTION PROGRAMS, AND EXPANDED EFFORTS TO PROVIDE NECESSARY VACCINES AND AGRICULTURAL EXTENSION SERVICES TO SUPPORT LIVESTOCK ARE ALL PIECES OF THE FOOD PRODUCTION PIE. HOWEVER, UNLESS AFRICAN GOVERNMENTS RECOGNIZE THE IMPORTANCE OF A SOUND ECONOMIC POLICY TO SUPPORT LOCAL FOOD PRODUCTION, ALL OF THE TECHNICAL ASSISTANCE PROVIDED WILL NOT MOVE AFRICAN FARMERS TOWARDS SELF-SUFFICIENCY. A STRONG COMMITMENT ON THE PART OF AFRICAN GOVERNMENTS TO SUPPORT THE LOCAL AGRICULTURAL SECTOR OF THE ECONOMY THROUGH BETTER PRICES FOR LOCALLY PRODUCED AGRICULTURAL PRODUCTS IS ESSENTIAL IN ORDER FOR THE FOOD PRODUCING MAJORITY TO INCREASE THEIR FOOD CROP YIELDS.

MR. CHAIRMAN, I WOULD LIKE TO AGAIN THANK THE SUBCOMMITTEE FOR GIVING ME THE OPPORTUNITY TO SUBMIT MY REMARKS FOR THE RECORD ON THESE VERY IMPORTANT ISSUES YOU ARE ADDRESSING TODAY. THANK YOU.

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Science and Technology for a Sustainable African Agriculture *

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Charles Weiss
Science and Technology Adviser
World Bank [1]
1818 H Street, N.W.
Washington, D.C. USA

The deteriorating economic and social condition of sub-Saharan Africa is probably the most serious problem confronting the development community today. Scarcely a week passes without dramatic new television coverage of starving victims of the African drought. Great efforts and large sums of money have gone into saving lives through emergency relief.

The current emergency is part of a long-term trend. Africa's population is rising at 3% a year, while its aggregate GDP per capita has actually fallen every year since 1980 and is now 4% below its 1970 level. Overall agricultural output per capita has declined, and food imports have increased to the point where they provide about a fifth of the region's cereal requirements.[2]

Nor are other sectors in better shape. Much of Africa's industrial capacity stands idle. Infrastructure,education and health services are all endangered by a serious shortage of funds. These economic difficulties feed and are fed by political instability in many African countries.

Compounding this bleak economic situation are serious problems of drought and environmental degradation. In 1984 there were actually two simultaneous droughts, which together covered a huge crescent-shaped area stretching from Senegal to Ethiopia and back across Mozambique to Angola. The drought in southern Africa seems to have been linked to the global meteorological/oceanographic phenomenon known as the El Nino/Southern Oscillation, and reversed itself this year as expected. In the Sahelian regions, in contrast, rainfall seems to have undergone a steady decline in the last twenty years. While data are still sparse and of poor quality, historical records indicate that such uniquely persistent droughts, which may last thirty years or so, are a recurrent feature of the Sahelian climate.

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[1] The World Bank does not accept responsibility for the views expressed herein, which are those of the author and should not be attributed to the World Bank or to its affiliated organizations.

[2] Towards Sustained Development in Sub-Saharan Africa: A Joint Program of Action, World Bank, 1985.

Human activities exacerbate the effect of the drought and contribute directly to soil erosion and desertification, both of which have reached crisis proportions.[3] Population increase in the humid tropics has put great pressure on traditional systems of bush fallow. Presently available technical packages for foodcrop and livestock production in many areas are inadequate to ensure sustainable returns at an acceptable level of risk and an affordable level of investment.

Cutting of trees for fuelwood and construction materials in semi-arid areas vastly exceeds the rate of replanting and regeneration.[4] Destruction of tropical rain forests is robbing Africa's future generations of much of their heritage of natural and genetic resources.

Population pressure, drought, urbanization, agricultural decline, degradation of natural resource base, and economic and political stability--all these problems reinforce each other. The fear of a prolonged downward spiral is in the back of all our minds even as we struggle to deal with these simultaneous challenges.

But where there are problems, there are also opportunities. The revolution in biotechnology opens up new avenues of research on plants, animals and man. Advances in space, communications, and energy technology could neutralize the effect of distance on African development. New ideas are urgently needed, and so is sustained political will in Africa and throughout the international community to put good ideas into effect.

Institutional and Policy Problems

The failure of African agriculture in the 1970s can be traced in large part to policy and institutional problems. In most countries, farm-gate prices have been kept low in order to lower food prices to the urban consumer and in order to finance general revenues. Cash crops have been penalized by overvalued exchange rates, which have often in effect deprived farmers of as much as half of the value of their production. Farmers have been further penalized by government efforts to replace the functions of the private market place--efforts which are doomed to failure in countries in which trained manpower is in short supply. Government monopolies of marketing and distribution of crops and fertilizers have almost without exception proved inefficient, and in many cases have been operated in such a way as to impose a serious disincentives to increased farm production, as well as creating a drain on fiscal resources.

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[3] Desertification in the Sahelian and Sudanian Zones of West Africa (World Bank Report No. 5210).

[4] Dennis Anderson and Robert Fishwick, Fuelwood Consumption and Deforestation in African Countries (World Bank Staff Working Paper No. 704).

At the beginning of the 1970s, insufficient special attention was given to the technical problems of African agriculture. It was widely believed that the high yielding varieties which had made possible the Green Revolution in Latin America and Asia, could easily be transferred to Africa, and would then make possible a substantial increase in yields.

But contrary to these early hopes, technology developed for Asian conditions has not been fully transferrable to Africa. The main Asian staples, wheat and rice, are not widely grown in Africa. Nor has Africa much potential for irrigation--the basis of the Green Revolution in Asia. A number of major investment schemes for agricultural development failed, not just because of poor policies or institutional weaknesses, but because the technologies being promoted to farmers for foodcrop production proved not to be immediately usable by farmers just emerging from the subsistence sector, because they depended for their success on inputs (s)he could not yet afford. Lack of appreciation for the role of women in African agriculture further inhibited the process of diffusion of technology.

In retrospect, the problems facing African agriculture are different from those faced by Asia at the time of the Green Revolution, and demand different technologies. First of all, the soils of Africa present a different set of problems. The majority are highly weathered and leached, and have no external sources of fertility from siltation or volcanic action. African pests and disease problems are many and include species, like tse-tse flies, for which no parallel exists in Asia.

Compared to South and East Asia, Africa has a weak infrastructure. Roads, railways, communications facilities, markets, input supplies, education, extension, hydrological and meteorological services, and other institutions supporting agriculture are all relatively underdeveloped. Data on water, climate, and other resources is spotty. What data are available has in many cases not been analyzed. Development assistance agencies have found that there are but few irrigation projects which pass their "hurdle rate" of return and hence are deemed good investments of the country's economic resources. Costs of construction are high in Africa. Sites are often remote and difficult, materials must be imported, competition is thin, unofficial taxes may be high, and suppliers must raise their prices against the possibility of not being paid. At least as important are the sociological and environmental implications of modern irrigation, which requires focussed, intensive effort by farmers who are accustomed to very different patterns of life and work.

Underlying the failures of imported technology in Africa is the weakness of local agricultural research institutions and extension sources. As we all know, effective research has to be location specific, and hence must be carried out in Africa in all its many and varied ecological zones. In Asia, local institutions played a critical role in adapting varieties developed by the international agricultural research centers to local conditions. But newly independent African states, particularly in anglophone countries, unfortunately allowed the research institutions they inherited from the colonial period to deteriorate and their experienced teams to disperse. The financial crisis of the late 1970s and 1980s administered the final blow to research activities, both in the agricultural research laboratories and the universities. What little funds remained for research are barely sufficient to cover salaries, leaving very little for books, journals, equipment, chemicals or fieldwork (unless these are supplied from abroad), and causing capable scientists either to leave or to rust in place. Shortage of foreign exchange exacerbates the situation. The weakness of university research has serious implications for the quality of teaching.

Africa is an extraordinarily diverse continent, ecologically, culturally and politically. A legacy of the colonial era is the fact that most of Africa is divided into many small countries, and that the boundaries between agro-ecological systems often cut across political boundaries. Each ecosystem has its distinctive crop and cultural patterns. As a result, many small countries in Africa cannot individually support a critical mass of research on each of the many crops which its farmers grow.5/

Before World War II, the colonial powers saw no need for research on foodcrops. There was little land or population pressure, and application of inputs to foodcrops would not have been profitable to the African farmer. Research on cashcrops was undertaken to control diseases and to maintain the quality of raw materials needed by the mother country. After the war, the research on cash crops was increased and research on food crops begun.

Since independence, the widespread but mistaken belief that technology could be directly transferred to Africa, led too often to a neglect of local research institutions. Among aid donors, including the World Bank, donors and African governments gave sporadic attention to the building of local research capability, but this attention often took the form of small, short-term projects not clearly enough related to any overall research strategy and too short-lived to achieve benefit. Different aid agencies often pursued contradictory objectives, and their

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5/ For example, of the 23 countries of West Africa (according to the World Bank's administrative geography), six have a population of less than a million and a half, nine between 1.5 and 5.5 million, seven between 5.5 and 15 million and only one above 15 million. Of the 23 countries in West Africa, the smallest nine spent far less than a million dollars each annually on research and the next group of six spent less than 3 million dollars each. These sums would be insufficient to maintain a critical mass of researchers, even in countries which grow only a few crops.

interest too often petered out when the drought-induced sense of urgency had passed. In some cases, excellent research has been carried out by expatriates, but little attention paid to training local research cadres.

Since the late 1970s, there has been a concerted effort to rectify the neglect of national agricultural research institutes in Africa. For example, the World Bank has lent a total of 880 million US dollars to reorganize and re-equip national agricultural research programs in Africa. Other donors have also played their part. Public sector agricultural research throughout Sub-Saharan Africa has reached 1% of agricultural GDP, a very respectable percentage which is roughly double the average for Asia. But this figure reflects a much higher cost per scientist, which is partly due to the large number of expatriates, and partly to the fact that African researchers are relatively few in number and can command closer to international salaries.

Substantial strides have been taken, particularly in the rapid training of agriculturalists and other technical manpower. But the newly refurbished research institutions, even in fairly large countries, have not been able to address major production problems to the degree that had been hoped, giving rise to serious concerns about their cost-effectiveness. There is still a pronounced shortage of trained African researchers. Qualified researchers, many of them recently returned from training abroad, are often frustrated by lack of funds for equipment, assistants, transport operating expenses and maintenance. Inspiring research leaders and administrators are scarce world-wide, but they are especially hard to find in Africa. Turnover is high, leading to lack of continuity. The social status of research is low, depressing morale.

The growth of indigenous research capability at the national level is essential to the scientific and technological development of Africa and indeed to the growth of its agricultural economy. Improved research management is particularly important.

As national institutions mature, they will become more effective in addressing national problems, and stand to gain more from collaboration in international research programs by adapting the results of such programs to local conditions. Participation in international programs can give recognition to talented and diligent local researchers and can motivate a general improvement in the standards of local research. To be sure, it also facilitates brain drain - but this can work both ways if expatriate Africans can be reinvolved in research on their country's problems.

Given the size and diversity of African countries, there is no alternative to regional cooperation among countries facing similar problems. But with only a few outstanding exceptions, the record of such regional cooperation in Africa has foundered on political and linguistic barriers, as well as on problems of coordination. The weakness of national research institutions, coupled with the failure of most efforts at regional cooperation to date, puts the international community in a difficult dilemma. Cooperation can succeed only if local capabilities are strong enough to enable countries to articulate their own deeply felt needs.

Regional cooperation cannot be imposed by the donor community, which can offer only its good offices and its technical and financial assistance. Once a political mandate has been achieved, day-to-day management of research needs to be left in the hands of competent technical people, subject to sufficient review and guidance to ensure that the research is directed toward the agreed strategic objective.

Strong regional research institutions do exist in Africa. French bilateral aid supports an extensive network of research laboratories in francophone Africa, which are gradually being nationalized. These support research on foodcrops, coffee, cocoa, oilseeds, livestock, fruits, and mechanization, cotton, rubber, forestry, farming systems and operational ecology. The FAO Desert Locust Control Program and the OAU's regional campaign against rinderpest are other outstanding examples of international cooperation under difficult political circumstances.

The experience of SAFGRAD, a network of maize and sorghum breeders extending throughout the continent, shows that a regional association of African crop breeders can work when it is based on local initiatives. SAFGRAD was set up by the Organization of African Unity and funded principally by US bilateral aid. A new variety of sorghum, recently released in the Sudan after a long collaboration between American and Sudanese researchers and the International Center for Research on Semi-Arid Tropics (ICRISAT), based in Hyderabad, India, gives hope for a substantial increase in sorghum yields in many parts of Africa.

Of the international agricultural research centers funded by the Consultative Group on International Agricultural Research (CGIAR) for research on foodcrops and livestock in the various tropical agroecological zones, three are located in Africa: the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria, the International Livestock Center for Africa (ILCA) in Addis Ababa, Ethiopia, and the International Laboratory for Research on Animal Diseases (ILRAD) in Nairobi, Kenya. ICRISAT has established a regional field station near Niamey, Niger, to carry out field tests on varieties of sorghum, millet and groundnuts under African conditions, and has a network of national support programs, principally in West Africa. The West African Rice Development Association, headquartered in Monrovia, Liberia, conducts regional research on rice in West Africa, but has been beset with political problems. (The International Center on Insect Physiology and Ecology in Nairobi is receiving contributions from the World Bank and other donors, but is not a CGIA member). Improved varieties of maize and cowpeas from IITA's commodity programs are beginning to reach farmers' fields, and new techniques have been developed and are being implemented for biological control of a major cassava pests. Other CGIAR-supported centers have collaborative programs in African countries covering maize, beans and potatoes.

Technical Problems Facing African Agriculture

African farmers need improved, sustainable packages for growing both food and cash crops, each of which has gone through a period of institutional neglect. Since independence, however, the research networks on cash crops created by the colonial powers have fallen on hard times, with a few notable exceptions, of which those in francophone West Africa are the most important. Too many of the developing countries have regarded the production of cash crops as relics of colonialism to be milked for funds with which to support industry and infrastructure, rather than as valuable economic activities which must be nourished with a stream of technological innovations. This is particularly serious in the humid tropics, where tree crops are still the only sustainable agricultural products.

The long tradition of colonial research on African cash crops has left a substantial legacy of technology well suited to plantation conditions. Especially for tree crops like rubber, oil palm and coffee, the difference between research station and plantation yields can be as little as 30%. African smallholders, however, often achieve no more than 15-20% of research station yields, implying a major failure of policy, extension and input supply, and economic incentives.

For foodcrops, by contrast, production is in most countries limited by the availability of technology suited to local conditions. Excellent varities of maize do exist for Eastern and Southern Africa. For cassava, good mosaic-resistant varieties exist but few have been well distributed to farmers. Newly introduced pests (mealybug and green spidermite) are causing extensive damage. Much more research is needed on sorghum, millets, rice and other small grains. For all these crops, the priority problem is developing resistance to local pests and diseases, using classical breeding techniques augmented by tissue culture, somatic hybridization, and the virological and immunological techniques of the new biotechnology.

For Africa's smallholders, the major technological task is the development of improved technologies which are adapted from and more productive than traditional technology and which are sustainable socially, ecologically, institutionally, and economically. This means that they must be suited to ecological conditions of Africa, should not disrupt traditional patterns of work, must not require heavy front-end investments or recurrent costs, and must not place too much of a burden on the limited managerial abilities of government officials or African small farmers.

The key to sustainable agriculture is the management of soils and water. In semi-arid areas, this means careful attention to farming systems that conserve water and nutrients so that they are available to the crop when they are needed. In areas of high rainfall, on the other hand, it means protecting the fragile soil from the erosive and leaching effects of heavy rainstorms.

Unfortunately, the requirement of sustainability sometimes places heavy demands on scarce management skills. For example, integrated pest management schemes or technologies based on pesticide spraying in response to observed levels of infestation are more demanding than regular weekly pesticide sprays or uniform monocultures.

This is ironic, because many of the traditional technologies of African agriculture did use principles which would today be called "integrated pest management". These traditional farming systems often combined food crops, trees and animals in balanced, sustainable systems that modern science is beginning to understand and to build on. Traditional technologies are also excellent sources of information regarding useful species of plant and animals that have not attracted the attention of modern agricultural technology.

Unfortunately, these traditional systems were increasingly disrupted by a combination of population pressure and drought. In order to help them to recover, it is important to understand both their social and their technical basis, so that they may be integrated with modern technology and made more productive, more intensive, and hence responsible to the current demand for increased agricultural production.

Improved technical packages for growing multi-purpose trees, both in humid and dry areas, are essential if Africa's tree cover is not to disappear. Existing technologies are often too expensive and in some cases ineffective for technical or social reasons. Indeed, sensitive handling of social aspects might encourage spontaneous, unsubsidized reforestation by local people. But even the best technology is helpless in the face of the relentless pressure for food and fuel to feed Africa's rapidly growing urban population. Energy conservation technologies can help, but substitute fuels, many of them imported, will be needed as well.

If the African agricultural sector is to play its proper role in supporting healthy economic growth, it must increasingly develop a commercial network for supplying inputs and equipment and conveying crops to market. It must also develop a more efficient system of extension and input supply to support the use of modern technology by small farmers.

On the output side, investment and research must be oriented, not only to subsistence and food security, but also to the creation of new income streams through commercial agriculture. This means attention to the entire marketing chain from producer to consumer, including processing, packaging, storage and transport as appropriate. This commercial orientation has up to now been largely lacking in the design of research programs to improve the state of food technology and related technical fields in Africa.

Livestock are closely integrated into traditional African farming systems as scavengers. They provide meat, milk, hides, urine, dung, and draft power. But their productivity is limited by poor health and poor nutrition - the result of poor extension services, lack of medicine, and the generally low productivity of African agriculture. And the sustainability of livestock production in some dry areas is threatened by overgrazing, the result of the breakdown of traditional systems of control of stocking rates on common grazing lands.

The first key area of livestock research is animal disease, of which the most important are trypanosomiasis and East Coast fever.

Research on trypanosomiasis spans the entire range of sophistication from the use of buffalo urine as a tse-tse fly atractant to the use of state of the art immunological techniques to unmask the means by which the trypanosome evades the immune systems of the host.

The second key area of livestock research is forage and feedcrops as elements of sustainable, productive African farming systems for both man and beast. The third is applied sociological and anthropological research on mechanisms to control overgrazing in arid zones.

Research on veterinary medicine had a strong tradition in colonial times in Africa. Reseachers in the colonies kept in close touch with their colleagues in France or the U.K., and made many important discoveries. Research on livestock production, on the other hand, is a relatively recent development in Africa, as indeed in the rest of the world. The major centers of livestock reseach on Africa are ILCA, ILRAD, the French-supported Institut d'Élevage et de Medicine Veterinaire des Pays Tropicaux, and the Henderson Laboratory in Zimbabwe.

With only a few exceptions, African farmers employ very limited animal or mechanical power. They are, therefore, restricted in the areas they can cultivate to that which they can till with hand tools operated by themselves and their family members. Under these circumstances, the unit productivity of labor and hence the wage rate is low. Schemes for tractor mechanization, many of them ill-conceived, have been bedeviled by high costs, poor maintenance, and shortage of foreign exchange for spares. Animal draft power has spread in many tse-tse free areas, but is hampered by the poor design of traditional equipment as well as the problems of poor animal nutrition and health discussed earlier.

Efforts to raise labor productivity through the introduction of mechanization require, first of all, the assurance that a farmer willing to make the investment in machinery will be able to earn sufficient cash from the agricultural surplus he produces to be able to pay off his investment. The introduction of machinery requires not only designs appropriate to the local situation, but commercial systems that will bring the new machinery within the reach of the African farmer: to inform, provide credit, deliver the equipment, explain its use, and provide repair and maintenance services. The same is true for renewable energy devices based on sun, wind, or crop or animal residues. Efforts to promote such devices thus require simultaneous attention to engineering and to industrial promotion.

Practical solutions are urgently needed in all these areas. But for the longer term, there is a need to begin to fill the many gaps in scientific understanding of soils, plant and animal nutrition, microbiology, meteorology, plant-plant and plant-animal interactions, climatology, and other agriculture-related disciplines. These gaps can weaken the ability to frame relevant policies. We do not know, for example, the degree to which human activities affect the persistence of the Sahelian drought--a subject of considerable importance to policy makers throughout the region. For this reason, basic as well as applied research is needed.

The process of building and/or reviving local capability has begun, but there is still a long way to go. The institutional, financial, and political constraints are many, and priorities and strategies will have to be carefully chosen and followed. The task will be long, and there is a great deal of lost time to be made up. But the need is urgent and critical. I know of no more important task facing the international scientific community.

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

ASSISTANT
ADMINISTRATOR

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WASHINGTON OFFICE
JAMES H. SCHEUER, M.C.

November 8, 1985

Honorable James H. Scheuer
Chairman
Subcommittee on Natural Resources
Agricultural Research and the Environment
Science and Technology Committee
U.S. House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

I appreciate your assistance in placing in the record the Agency's Plan for Agricultural Research in Africa. Additional copies will be provided for distribution to interested Committee and staff members. Since a number of the questions raised by Committee members and Congressman Gilman were outside the specific scope of the Agriculture Research Plan itself, we would like to submit, also for inclusion for the record, the enclosed report by the Group of Experts on Aid to Africa appointed by the Bonn Economic Summit. This group of experts met in July and September of this year to discuss a number of issues covered by your Committee's recent hearings, specifically, agriculture research, early warning systems, transport and desertification. Participation was by the Summit Member Countries, i.e., Japan, Canada, the United Kingdom, France, the Federal Republic of Germany, Italy and the United States, as well as the European Economic Community. I think you will find the report useful in highlighting some of the concerns and proposed actions set forth by this group. The U.S. delegation was chaired by my deputy, Alexander R. Love, and reflects A.I.D.'s concerns about these issues.

You might be particularly interested with the final remarks on page 18 where the participating members of the group of experts set forth their concerns about the relationship between population growth and key issues of food production and desertification. The statement is quite consistent with your expressed concerns on the subject at the opening of the hearings.

With respect to the section on desertification, the U.S. delegation at Bonn distributed copies of Lester Brown's Worldwatch paper on "Reversing Africa's Decline" to the other Summit members and the EEC representative along with our Agricultural Research Plan.

Thank you again for your interest in these critical development issues in Africa. We would be pleased to provide any further information the Committee or staff may desire on this subject.

Sincerely,

Mark L. Edelman

Mark L. Edelman
Bureau for Africa

Enclosure: as stated

SUMMARY

Report of the Group of Experts on Aid to Africa

Appointed by the Bonn Economic Summit

The Report Preface reiterates the Summit Countries concern over the crises in Africa and renews their commitment to assistance for emergency relief, recovery and long-term development. It proposes an international partnership to help African nations achieve self-reliant and self-sustaining development.

The Report outlines the main causes of the crises, and commends the difficult, and often painful adjustment processes African states have already undertaken. It refers to the recent Summit of the OAU in Addis Ababa in July, 1985, where African countries underlined their awareness of the multiple crises they must resolve and the solutions which are required, for example:

- Many people are experiencing immediate food shortages; they also face the huge task of restoring ecosystems destroyed by successive years of drought and environmental degradation.
- Many governments face short term debt problems, and need to overcome the long term effects of unsound economic policies.

The followup measures proposed in the Report are organized in two parts: analysis of key problems addressed, followed by concrete recommendations for actions to be taken to address both short and longer term needs. A wide range of organizations are identified to fund and implement the 37 measures proposed, in collaboration with local governments and communities. The topics covered are those identified in the Bonn Summit Declaration:

- Improvement of crop monitoring and early warning systems, through a comprehensive approach of institution building.
- Improvement of transportation and national and regional preparedness plans, through rehabilitation and maintenance.
- Increased agricultural production through recovery assistance under the impetus of the OAU Summit at Addis Ababa, and the involvement of public and private sectors.
- Support for national and international agricultural research, through a special program to strengthen African reseach capability, with the World Bank taking the lead.
- Support to combat desertification, including emphases on reforestation, local mobilization, and regional networks.

The Report concludes with a "Final Remark" noting the key role of population growth in achieving recovery and development. Actions taken in this area should follow the lines agreed at the International Conference on Population held in Mexico in 1984.

Bonn, 9 September 1985

Report by the Group of Experts on Aid to Africa appointed by the Bonn Economic Summit

Preface

The May 1985 declaration of the Bonn Summit voiced the concern of our Governments over the critical economic situation in Africa and renewed their commitment to the provision of assistance for emergency relief, recovery and long-term development.

In July, at a meeting of the Organization of African Unity (OAU) held in Addis Ababa, Heads of State and Government of African nations concluded that external factors and domestic policy shortcomings had brought most of their countries close to economic collapse. They set down priorities for action and committed their Governments to the gradual increase in the share of agriculture in national total public investment to between 20 to 25 percent by 1989.

Recent world economic developments have impaired the capacity of many African countries to build, and indeed in some cases to sustain, momentum. In certain parts of the continent destabilizing conflicts are disrupting and compromising progress. It is proposed that the Summit Countries and the European Community maintain and strengthen their efforts towards world economic recovery and collaborate with African nations on measures to ensure that they benefit fully from that recovery.

The magnitude of the challenge calls for a renewed and strengthened international partnership with Africa. The environmental degradation and food shortages must be checked and reversed. Decisive action is required on the part of African Governments and peoples, who have primary responsibility for their recovery and development; international action to supplement their efforts is essential. It is proposed that the Summit Countries and the European Community pursue and deepen consultations and collaboration with African nations leading to a true partnership in recovery and development.

The emergency in Africa has brought our peoples closer together. It has drawn large numbers of voluntary organizations and ordinary citizens into direct action. Their further involvement and the direct contacts they have developed with their counterparts in Africa should be stimulated. International co-operation must translate into people helping people. The objective is to meet a priority set by Africans: to promote self-reliant, self-sustaining development that will be durable and solid.

A. Introduction

I

The situation in sub-Saharan Africa

Over one hundred million people in sub-Saharan Africa suffer from hunger and malnutrition. Per capita food production has dropped by some 20 % over the last 20 years. While the population increased annually by 3 %, food production merely increased by 1.2 % a year. Grain imports already absorb approximately 20 % of the total foreign exchange earnings of sub-Saharan Africa.

The favourable macro-economic conditions observed in the early 1970s dramatically deteriorated in the early 1980s. The previously stagnant per capita income has declined by 2 to 3 % per annum, the current account situation is worsening, and debt servicing already consumes approximately one quarter[1] of current export proceeds. This has further reduced the flexibility of already vulnerable African States to respond to the additional burden of successive years of drought and production failures.

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[1] excluding Nigeria

The present crisis is characterized not only by general shortages of food in the worst affected countries but also by the inability of the rural populations in arid and semi-arid zones to survive successive years of drought, which triggered environmental and social collapse for hundreds of thousands who were already living at the economic margin.

The main causes of the crises are:

- the destruction of the eco-system by persistent drought and environmental degradation;
- inappropriate macro-economic and sectoral policies such as insufficient incentives for the agricultural and livestock sector, including inadequate marketing and pricing arrangements;
- lack of means of transportation;
- inadequate attention to improving and disseminating agricultural technology for Africa's key crops;
- population growth generally in excess of 3 %;
- unfavourable economic conditions which have included not only deteriorating terms of trade and declining commodity prices but also a growing debt burden together with liquidity shortfalls and budget constraints;
- armed conflicts.

Although the economic problems facing sub-Saharan developing countries are likely to persist in coming years, we are confident that there is a chance of mastering the situation if sound policies on the part of African Governments go hand in hand with increased support by the whole international community comprising all countries in a position to contribute to this effort.

The last Summit Conference of OAU in Addis Ababa in July 1985 has demonstrated that African States are aware of the critical nature of the crisis and of approaches needed to tackle it. Courageous efforts have already been undertaken by certain African countries concerned. We must commend the difficult - indeed painful - adjustment processes many African States have undertaken to bring their internal and external accounts into closer balance.

II

Action required

1. The first priority must continue to be short-term emergency aid of all kinds, reaching those who are most vulnerable and most affected. This demands continued efforts by African States and by the international community well into 1986, both in supplying and in distributing the means of life to all drought and famine victims.

2. A vital role has already been played in co-ordinating international aid to reinforce African efforts by the international agencies, and especially by the Office for Emergency Operations in Africa set up by the United Nations Secretary General and by the World Food Programme (WFP). The Summit Countries and the European Community will continue strongly to support this work.

3. The next phase, which has fortunately already arrived in some of the affected countries, is the recovery phase of those populations affected, so that they can resume a productive and self-reliant life.

4. But it is necessary for African Governments to look beyond immediate needs to the more fundamental problems that have made this crisis so severe. The longer-term climatic and demographic trends plainly show that the risks of recurrence are increasing. It is urgent to foresee

these problems now and to help African countries do what is possible to confront them.

5. The Summit Countries and the European Community believe that it will be essential for themselves and other donor countries and institutions to reinforce the actions that have already been taken, preferably by participating with each affected country in an examination of the experience gained from the present crisis but also by concentrating on the following main fields in which specific follow-up action seems required.

6. First, there should be much better arrangements for monitoring crops and for access to food by vulnerable groups. This will require collaboration with African countries and international organizations to improve early warning systems and distribution of emergency food supplies.

7. It also implies assistance to African Governments to improve transport systems, whose weakness has impeded food distribution, as well as to improve national and regional preparedness plans.

8. Increased agricultural and food production lies at the heart of the problem, and in this context we should respond to the important decisions now taken by the OAU Summit at Addis Ababa to raise the volume of their domestic resources going to agriculture. Emphasis therefore should be placed on the formulation and implementation of agriculture and food policies which would give priority to smallholder farmers, particularly women, who produce the vast majority of subsistence food crops. This also implies much improved institutions for extension, marketing and research, including encouragement for the non-governmental and private sector.

9. It is essential to the realization of a "Green Revolution in Africa" to improve international assistance towards long-term agricultural research and make such research more relevant to the needs of the small producer, with particular emphasis on measures, including reafforestation,

to prevent further environmental degradation.

10. Human resource development is an indispensable condition for any rural development programme in Africa. Moreover the impact of population growth and rapid urbanisation on environmental protection, food security and economic development prospects also need to be taken into account.

B. Recommendations for follow-up measures by the Summit Countries

The following individual measures are proposed for the priorities specified above:

1. Improvement of crop monitoring and early warning systems

1.1 The improvement of early warning systems cannot be disassociated from the wider task of restoring or building-up the national capacity to collect, interpret and disseminate meteorological information and monitor crop evolution, data on food stock situations and other relevant social and economic indicators of food crises.

The Summit Countries and the European Community recognize that without successful development of national and regional capacities in Africa itself no adequate overall early warning system is possible.

Although emphasis must necessarily be placed on the revival and|or reinforcement of national agro-meteorological services, regional organizations such as Centre Régional de la Télédétection Ouagadougou (CRTO), Regional Remote Sensing Facility (RRSF) in Nairobi or Centre Agro-météorologique et Hydrologique (Agrhymet) in Niamey have an important role to play to improve knowledge on natural resources and its utilization by the farming populations.

As a complement to national and regional efforts, the Food and Agricultural Organization has operated an early warning system on the basis of on-the-spot information collected in member states and of remote sensing data. This FAO system plays a valuable role in many respects and has drawn attention to the drought and emerging famine in Africa.

1.2 It is proposed that Summit Countries and the European Community support the efforts for improving existing crop monitoring and early warning systems

- by ensuring that primary attention is focused on developing and|or restoring the basic agricultural data systems within Africa itself. This effort will include attention to the national agricultural systems themselves as well as support of regional efforts such as those encompassed in the Sahel and the Southern African Development Co-ordination Conference (SADCC) regional food security programmes;

- by helping to establish or reinforce agro-meteorological and crop reporting services at the country level. This will include contributing to the improvement and support for the functioning of these services through institution building, training, development of agro-meteorological stations and access to remote sensing facilities;

- by making regional organizations such as CRTO, RRSF and Agrhymet more effective, and by improving the co-ordination and collaboration between these organizations and the FAO early warning system;

- by helping to standardize the physical, social and environmental criteria for the early detection of food shortages, including shortages in particular regions of individually affected countries;

- by encouraging FAO in the improvement of its early warning system;
- by increasing the basic and advanced training facilities available in this sphere. In this context the September 1986 Berlin Conference on user assistance and training should be encouraged to give priority to the requirements of African countries;
- by recommending that the panel on remote sensing established as a result of the Versailles Summit be charged to formulate technical guidelines on the use of remote sensing with particular attention to African countries, also taking into account in their meetings the financial and management constraints affecting various African countries to enhance early warning capacities regarding drought conditions in sub-Saharan Africa.

2. Assistance to African Governments to improve transport and national and regional preparedness plans

2.1 There is a need to build on and enhance existing efforts to set up and implement national preparedness plans spelling out the various phases of crisis monitoring and management and associated administrative arrangements to be taken to make best use of local resources, calling on neighbouring countries and integrating external donor support with domestic action.

Owing to the overburdening of numerous African ports, inadequate storage facilities, bottlenecks in railway or road systems and administrative problems in the recipient countries, the assistance supplied either fails to reach many of the needy or reaches them too late. Bottlenecks have sometimes been exacerbated by the inappropriate phasing of relief supplies. Compounding the difficulty of effective relief distribution has been past neglect of investment in the management of, and improved policies for, basic transport infrastructure including ports, related storage, and especially continued neglect of road and railway systems.

Co-ordinated efforts to date and the role of the WFP Africa Emergency Task Force have helped to ease logistical bottlenecks. However further and even more closely co-ordinated action is required to tackle underlying constraints.

2.2 It is therefore proposed that the Summit Countries and the European Community

- help to improve national systems for emergency monitoring and relief, including food security arrangements, by providing, as appropriate, assistance for contingency planning, stock management, and food stocks in the framework of existing storage capacities by African countries concerned to supplement local crop production;

- contribute to the reconstitution of such stocks when emergency requirements are foreseen;

- provide logistic means necessary to efficiently transport the aid: supply of lorries, spare parts and maintenance workshops which should function beyond the short period of emergency; make available air transport capacity particularly for remote areas in the absence of appropriate road and|or rail capacity;

- support African countries, within the scope of existing bilateral security co-operation, in the deployment of their military logistical means to participate in food distribution, as well as making available - where possible and cost-effectively - material and human resources of the armed forces of the Summit Countries;

- co-ordinate even more closely their supplies of food aid, with due regard for the port, storage and distribution facilities available in the recipient countries, and in this connection advocate an even stronger co-ordinating role for WFP, including its computerized World Food Programme Information System for Africa (WISA);

- request, jointly and in collaboration with WFP, the Governments of recipient countries to remove any administrative bottlenecks, e.g. as regards import formalities;

- support the task force sent by WFP to help African Governments resolve logistical problems in the most heavily frequented and overburdened African ports;

- contribute to the protection of food and seed, including stores in ports, so as to prevent food supplies awaiting forwarding from being spoiled by adverse weather conditions;

- give attention to the long-term requirements for strengthening management and maintenance of transport systems through bilateral programmes on a regional and country-by-country basis. Attention needs to be paid not only to rehabilitation of systems degraded through long-term neglect and extra services to support emergency transport requirements, but also to broader management and recurrent cost issues to be addressed by improvements in tariff policies, rates and maintenance plans. The recent meeting on road maintenance convened by the World Bank in London is an important step in this direction. The railway systems require similar attention, as their important role in long-term economic development and possible future emergencies will be determined by timely investment before the onset of the crisis.

3. Increased agricultural and food production

3.1 The present emergency, which requires the provision of subsistence food for famine victims, should not distract attention from the need to provide them with assistance for relaunching productive activities in the recovery phase.

Owing to a lack of foreign exchange, the sub-Saharan countries affected are not able to provide most of the requisite agricultural inputs, such as seed, fertilizers, pesticides and farm implements in order to rehabilitate their ailing agriculture rapidly and ensure the next harvest. The Summit Countries and the European Community are already making emergency contributions in this field within the scope of their bilateral co-operation.

But for longer-term famine prevention it is generally recognized that comprehensive food strategies are needed to ensure lasting improvements in food production, distribution etc. and hence food security. African Governments have acknowledged the need for greater priority to the agricultural sector, and their responsibility for designing and overseeing the implementation of comprehensive and appropriate food strategies, which take account of the need to improve incentives and services for producers and the efficiency of agricultural marketing systems (OAU Summit in 1984 and 1985, the Economic Commission for Africa (ECA) meeting in 1985).

A successful agricultural strategy would include particular attention to the needs of smallholder producers, especially women, and their complete access to the various institutional, legal and economic support services.

Improved agricultural and food production is given priority attention by the Summit Countries and the European Community, the World Bank and by the International Fund for Agricultural Development (IFAD). The European Community in co-operation with other bilateral and multilateral donors has, to start with, promoted food strategies in four African countries in the framework of a constant dialogue with recipient countries and as part of its special programme to combat hunger in the world. The Lomé III Convention recognizes the need to intensify and generalize these efforts.

Losses of both crops and stocks from pests and diseases assume unacceptable proportions and contribute greatly to the overall food deficit. Of special significance are the "universal pests", particularly termites and those migratory pests which are of regional importance and recognize no national boundaries. While the Summit Countries and the European Community have well-developed expertise and institutions to assist with the attempted control of the latter (locusts, weaver birds, army worm, the greater grain borer etc.) the need for regional co-ordination and co-operation is essential if fully effective measures are to be implemented.

3.2 It is proposed that the Summit Countries and the European Community

- acting in co-operation with the World Bank Group, the African Development Bank and the International Fund for Agricultural Development, maximize their bilateral co-operation funds for providing effective support to comprehensive and appropriate agricultural sector policies and food strategies designed by sub-Saharan countries particularly affected by drought;

- use their aid to support appropriate policy and structural changes introduced by African countries to improve production and marketing and especially to provide incentive prices and goods which will encourage small farmers (including women) and herders to produce for the growing urban markets, and where appropriate, for export;

- utilize remote sensing technology and improved crop reporting systems not only for the early warning system aforementioned but also for the establishment and monitoring of proper agricultural development plans including food strategies;

- make available, within the framework of their aid programmes and in combination with their support to extension services, to farmers' and women's organizations, and to management in developing countries, increasing and continuing support for the development of the agricultural sector (including forestry, fisheries and livestock);

- invite the International Bank for Reconstruction and Development and the African Development Bank to become more actively involved so as to expand and complement the action already taken in regional pest control programmes, which should be more effectively co-ordinated.

4. Support for national and international agricultural research

4.1 Agricultural research provides a strategic basis for achieving a sharp increase in agricultural production in Africa, which could be called a "Green Revolution for Africa", as shown by the experiences of the Green Revolution in Asia and Latin America.

However, it is a cause for concern that agricultural research services in Africa are not providing adequate answers to farmers' problems. The shortcomings have included failure to develop appropriate new technology packages as well as failure to adequately develop effective linkages to disseminate existing technologies. Remedies are made more urgent by the drought.

These national research services need to be reconstituted and - where appropriate - linked closely to post-secondary educational institutions and to improved systems such as private and national extension services with the sustained support of the African Governments and the entire international donor community.

But national research services will not be able to carry out their essential functions - in terms of both basic and adaptive research - without closer collaboration from the wider international research efforts, including the 13 international research centres funded through the Consultative Group on International Agricultural Research (CGIAR), which have achieved their greatest success to date with the development of high-yielding types of wheat and rice. Research into major crops, livestock and other natural resources and farming systems suitable for arid and semi-arid regions deserves more focused support in view of the critical situation in sub-Saharan Africa. Use should be made of the potential of national research institutions and of regional institutions in Africa. Of complementary importance is the multiplication of the best seeds including indigenous varieties on a wide scale. Agricultural research supported by the Summit Countries and the European Community merits higher priority.

Particular action is needed to avoid duplication of efforts, to arrange effective dissemination of new technology, and to keep current the results of past and ongoing research, especially into particular crops in individual and ecologically similar zones.

In addition to the importance of research on the technical aspects of agricultural production, account must also be taken of research into food and food aid policy issues. The questions of the developmental as well as humanitarian use of food aid, its integration into national agricultural development policies, and its possible contribution to the alleviation of balance of payments burdens, in appropriate circumstances, merit ongoing consideration.

4.2 It is proposed that the Summit Countries and the European Community in the context of their development co-operation policies

- continue to support, in co-operation with the World Bank and other donors, the restoration and improvement of national research systems of African countries, on the basis set out above;

- encourage the World Bank to play a more active role in the effective co-ordination of donor support for national research work, taking into account the work of the CGIAR centers;

- support specific work into the growing and processing of major crops, trees and shrubs, pest control, and farming systems especially suited for arid and semi-arid areas and for the local communities living in those areas, including the testing of plant species in particular localities;

- promote multiplication of the best types of seeds, and support their dissemination via all possible channels of distribution be they public or private;

- encourage the CGIAR system and International Agricultural Research Centres (IARCS) to accelerate the redirection of their resources towards basic research needs in Africa and especially of the drier areas;

- support and further develop commodity networks which link national research and educational institutions with each other and with existing IARCS primarily for the commodities of cereals, especially for arid zones, pulses, root crops and forages;

- promote and improve effective donor co-ordination and African regional technical co-operation to strengthen the national research systems through various structures such as Southern African Development Co-ordination Conference (SADCC), Comité Permanent inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS) and the Club du Sahel. This should include the expansion and strengthening of third country technical co-operation wherever appropriate.

5. Desertification

5.1 Desertification is part of a long-term process of sustained environmental degradation which may be accelerated by drought but is caused primarily by overuse of land by humans and livestock, thus threatening the ecological balance in many previously productive areas.

There are no promising short-term or grandiose solutions to this complex process. Longer-term answers depend primarily on those who are the custodians and beneficiaries of the threatened land.

Past experience shows that communities themselves can be mobilized to combat desertification through locally based agroforestry at the farmstead, social forestry at the community level, and soil and water conservation. Serious medium and longer-term efforts must also be undertaken to help make population pressures more manageable, to develop the human resource base and to improve sector policies for rural and urban development.

5.2 In view of the complexity and gravity of the desertification process, it is proposed that the Summit Countries and the European Community should

- support, and help to co-ordinate closely, the efforts made to redress the problem at the initiative of the affected African countries;

- incorporate into all development programmes and projects, where possible, components to safeguard and improve the natural resource base;

- support socio-economic research to establish the best answers to questions such as land tenure, how to mobilize rural communities to activities related to combat desertification; and how to avoid disincentives created by prolonged food aid;

- support action to mobilize local communities and to allow them to tackle effectively at their level the problems of environmental protection including in particular by reafforestation. In this context work by local and overseas organizations is to be supported, including the mobilization of volunteers, such as international "green corps" movements, to carry out timely and cost-

The conference which will be organised by France in Paris at the beginning of 1986 will permit exchanges and discussions necessary for the intensification of the fight against desertification in Africa.

6. Final remarks

6.1 As many African Governments increasingly recognize, the inexorable rise in their populations, particularly in the urban areas, places an immense strain both on their ability to provide basic services like education and health, and on the fixed resources represented by their land (and especially their arable land). The severe impact of this present famine has been greatly aggravated by massive migratory movements and the high rate of growth in the population in relation to the rate of growth of food production in the worst affected countries since the previous widespread drought. But the standard projections show far greater rises on the way. Within the lifetime of many born today, the population of the seven worst affected countries will rise from 80 million to 358 million people.

Any action in this area can only be taken in support of strategies worked out by each African Government within its local socio-cultural envirenment. It seems, however, necessary to underline that the measures proposed in relation to agricultural development, food production and the degradation of the environment must be accompanied by actions of the African countries to address the issue of population growth. If requested to do so, the Summit Countries and the European Community are open to consider favourably requests for assistance in this crucial area and support organizations such as the United Nations Fund for Population Activities (UNFPA) and the World Health Organization (WHO) as well as other agencies active in this field. Such effective assistance in co-operation with the relevant communities under the supervision of expert professionals;

- encourage and support the revision of formal educational curricula so that they better reflect the seriousness of the environmental problem, as part of African countries' own efforts to make education more relevant to life in their societies;

- support research on local and exotic tree species capable of providing fodder, fruit, especially for communities in the drier areas, and on fuelwood and development of alternative energy sources. Help should also be given to develop the capacities of forestry and related administrative services to deal with these problems;

- support the establishment of national networks between government, non-governmental and private agencies to exchange information on factors for combating desertification, act as clearing houses, and stimulate faster and wider action, adapted to the varied needs of different regions and communities;

- support regional initiatives aimed at understanding the factors affecting desert encroachment and spreading knowledge of successful approaches to slowing it. This should include support for disciplined, co-ordinated efforts, in particular from institutions like the Intertropical Network for Research on Resistance against Drought and from regional associations such as the CILSS, the SADCC and the East Africa Djibouti group, among others, as well as support for other activities in the field;

- support activities undertaken by relevant multilateral organizations such as the United Nations Environmental Programme and the Food and Agricultural Organization to assist national and regional activities to combat desertification.

action should follow the lines agreed by consensus at the International Conference on Population held in Mexico in 1984.

ANSWERS TO FOLLOW-UP QUESTIONS FOR AFRICAN CLIMATE HEARING

Sharon Nicholson
Department of Meteorology
The Florida State University

Q 1. You stated on page four of your written testimony that "the persistance of this drought for nearly two decades does not necessarily signal a long-term climate change...on the other hand we also cannot rule out the possibility..." What could cause a long-term climate change?

A Keep in mind that a "change of climate" merely means that conditions significantly different than the prevailing ones persist for a sufficiently long time period. What constitutes "significantly different" and "sufficiently long" is in part semantic, but there is agreement that the earth has experienced changes of climate during both distant and recent history. The causes of change are two-fold: those external to the atmospheric system (and cannot be influenced by it) and internal ones. The latter include changes of solar output, the geometry of the earth's orbit with respect to the sun, and volcanic activity, among other things. Internal factors include various feedbacks among inter-related parts of the climate system, especially those operating on different time scales (e.g., ocean currents, glaciers, which vary more slowly than the atmosphere). Changes in the earth's land surface also fall in this category, as does change of the carbon dioxide content of the atmosphere.

Q 2. You mentioned in your statement that the African weather patterns could influence American weather. Would research on the driving mechanisms of the African drought help us to assess our own future?

A I do believe that research on African drought can help us to better assess U.S. weather. This should certainly be true with respect to such problems as hurricane forecasting. Intuitive reasoning suggests that there are potential global effects of extreme drought (or wetter conditions) over an area as large as Africa but this question has never been investigated. If global weather conditions are influenced, the U.S. would certainly be affected as well.

Q 3. In their written testimony both Dr. Shukla (on page 5) and Dr. Nicholson (on page 2) stated that deforestation and desertification caused by misguided land-use practices could result in local or regional climate change, possibly leading to increased severity of the drought. What are some of the ways man's influence results in local or regional climate change?

A The best known local effect is that of the city. Replacing the natural environment with concrete, buildings and automobiles (plus thermal energy from residential and office heating) greatly changes temperature, winds and rainfall in cities and their surroundings (even with cities as small as perhaps 50,000 inhabitants). Regional effects on climate change have not been adequately demonstrated but many scientists believe that the potential for change is there (especially if we continue to change the earth's surface). Removal of vegetation on a large scale changes the temperature, moisture content, aerodynamic "roughness" and reflectivity of the surface and also promotes soil erosion. These in turn determine the partitioning of energy in the earth-atmosphere system, and thereby influence such things as evaporation and rising air currents, which are critical in the process of rain formation. A related problem is that removal of vegetation and erosion of topsoil, which dramatically affect the capacity of the land to retain moisture: even if rainfall does not change, less of it can be utilized. A final effect of man's activities is the production of carbon dioxide; many believe the global warming between c.1880 and 1960 was due primarily to this.

Q 4. Do you think that the recent rainfall in this region means that the drought is over?

A One good year (actually, it is more like one or two normal months) cannot be interpreted as an end to the drought. A similar increase occurred in 1976 in the Sahel, but after that time drought returned and intensified. Also, the "recent rainfall" may have been very limited in area - I don't believe we yet have sufficient information to assess the situation.

Q 5. Do you have any recommendations for legislation, for example to obtain more data or to improve African archiving and assessment capabilities?

A What falls into the category of legislation? What is needed is
- a) a major field research program to study African climate
- b) a major effort to provide certain types of equipment which will help to establish long-term data aquisition, especially of upper air data (most countries have sufficient personnel, but they may not be able to afford the radiosondes, weather balloons, and helium used on a daily basis).
- c) a major computer technology transfer, not of billion-dollar supercomputers, but of $100 microprocessors and recording diskettes, for example.
- d) assistance from international agencies to promote and financially support such activities as data archiving, publishing and dissemination.
- e) continued and expanded support for maintaining satellite observing systems, both weather satellites like those operated by NOAA, and surface-oriented satellites (such as LANDSAT)
- f) assistance by American government personnel based in African countries to obtain from the meterological services certain routine types of weather data. If good cooperative relationships with the meteorological services can be established, a usable body of data might be obtained by one person spending as little as a few days a year to obtain the proper records, if that person is properly advised by research scientists.
- g) better means of collaboration with African scientists.

Answers to Follow-up Questions for African Climate Hearing

Eugene M. Rasmusson
Diagnostics Branch
Climate Analysis Center

QUESTION 1

On page 8 of your written testimony you stated that "drought conditions have eased over most of the semi-arid region of Africa during the past nine months." Does this mean that the drought is over?

ANSWER

Rainfall during 1985 over the semi-arid regions of Africa, particularly the Sahel and Ethiopia, was well above the values recorded during the previous three years. Since the climatic processes associated with the long-term downturn in rainfall over the Sahel are unclear, there is no basis for judging whether 1985 reflects the beginning of a less arid period, or simply a brief respite from a long-term drought regime.

QUESTION 2

In submitted testimony, both you (on page 8) and Dr. Shukla (on page 6) stated that our Great Plains have witnessed severe drought episodes--such as the "Dust Bowl" era of the 1930's--which were similar to the African drought. Can we now predict when our own droughts will recur?

ANSWER

There is as yet no real understanding of the climate processes which lead to severe drought episodes over the Great Plains, such as those that occurred during the 1930's and 1950's. Present U.S. Weather Service operational forecasts of 3-month average rainfall departures over the U.S. are made at the end of each month for the next 3-month period. These forecasts exhibit only marginal skill. Neither the skill level nor the short lead time of the forecast is adequate for useful prediction of long-term drought.

QUESTION 3

If droughts can be tied to global circulation patterns (as you stated on page 4 of your written testimony):

A. How much lead time will that give us for drought predictions?

ANSWER

There is no single answer to this question. Potential lead time probably depends on the region involved and the particular global climate processes at work. In those cases where drought is foreshadowed by sea surface temperature changes, there appears to be the potential for useful predictions a few seasons in advance. The degree to which the future course of the long-term, 30-year downturn of rainfall over the Sahel can be predicted is unknown, since we do not yet know its cause.

B. How far are we from being able to predict a drought in sub-Saharan Africa one season in advance?

ANSWER

This, again, depends on the region involved. Over West Africa and Southeast Africa, where relationships between rainy season anomalies and sea surface temperature fluctuations have been established, the methodology and data for developing useful, although by no means perfect, forecasts one season in advance appears to be available. Over other parts of Africa, where clear cut empirical relationships have not yet been found, an assessment of potential predictability cannot yet be made. In this case the answer must await further analysis of the historical data and further development of experiments with global general circulation models of the atmosphere and ocean.

C. Would research on the driving mechanisms of the African drought help us to assess our own future weather patterns?

ANSWER

Since global climate processes play an important role in African climate variability, a research program with an African drought focus might improve our general uderstanding of global climate variability and its effect on North American climate. Associated research on land-surface-atmospheric interactions might also have broad application to the general questions of drought-related processes.

D. What is the possible impact of the African drought on American weather systems?

ANSWER

Climate fluctuations over the entire globe are linked to some degree. In some cases, such as the El Nino/Southern Oscillation phenomenon, the linkages are strong and reasonably well documented and involve both North America and Africa. However, a general linkage between persistent African drought and North American climate has not yet been defined. On the shorter "weather" time scale, medium-range North American weather forecasts (5-15 days) are affected by current conditions over the entire earth; thus, the availability of African data is important for these forecasts.

QUESTION 4

Do you have any recommendations for legislation, for example, to strengthen U. S. drought-predictive capability or to focus climate research on the Africa drought?

ANSWER

I have no specific recommendations.

Comments on "Monitoring and Forecasting Drought and Famine," by Hanrahan and Epstein

I would like to clarify the discussion on NOAA activities described in the section on U. S. government activities involved in monitoring and forecasting drought and famine.

As stated, AISC is involved in the assessment of the impact of climate fluctuations. In addition, the Climate Analysis Center (CAC) of the National Weather Service is responsible for the routine operational monitoring and dissemination of data and information on global climate fluctuations. Among the units of the CAC is the Agricultural Weather Section of the joint USDA-NOAA Agricultural Weather Facility, which provides the current climate information required by USDA.

The CAC is responsible for issuing monthly and seasonal outlooks (temperature and precipitation), which presently are limited to the northern hemisphere north of 30°N, and focused on the United States.

Eugene M. Rasmusson
Chief, Diagnostics Branch
Climate Analysis Center
National Meteorological Center
National Weather Service
National Oceanic and Atmospheric Administration (NOAA)
October 30, 1985

Questions and Answers for African Climate Hearing
Before The
Subcommittee on Natural Resources, Agriculture
Research and Environment
Committee on Science and Technology
House of Representatives
By Dr. Joan C. Hock
Director, Assessment and Information Services Center
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

September 19, 1985

Question:

If the public perceives that the crisis is over now that rains have returned to many areas of sub-Sahran Africa, what effect will that have on your funding?

If funding levels are reduced, how will that effect NOAA's ability to provide drought early warning and climate impact assessments in the future?

Answer:

As this particular crisis passes, the level of emergency resources devoted to it will decline. But support, talent, and resources must still be devoted to famine forecasting programs. The risk of drought still exists and there is a critical need for improvements in the technical capabilities of most African nations. Early warning information is essential for improved economic, agricultural and food security decision making. The technology for these African programs has already benefited from advances made by U.S. and international organizations involved with operational drought assessments. For example, the dramatic advances in the operational use of NOAA polar orbiting meteorological satellites have enhanced U.S. agricultural assessments in Africa. Government and international organizations such as the UN/FAO and UN/WMO are also using this imagery. It is important to balance the long-range interests of the U.S. and the near certain recurrence of African drought against short-range swings in public opinion.

NOAA's drought early warning and climatic impact assessment program for sub-Saharan Africa (i.e., the eight Sahel countries, Sudan, Ethiopia, and Somalia) is funded by AID through FY 1986. AID has primary responsibility for such disaster mitigation efforts for developing countries. NOAA/NESDIS, as a science rather than foreign assistance agency, does not have base funding for climatic impact assessments in developing countries. Therefore, if AID reduces the funding it provides NOAA for this, the NOAA/NESDIS early warning assessments for approximately 80 developing countries will be curtailed beginning in FY 1987.

Question:

You state in your testimony that the Assessment and Information Services Center tracked and reported on the drought situation during the period 1982-84.

A. Who did you report to?

B. Were drought and food production warnings issued by other organizations? If so, which ones?

C. Why were the warnings ignored?

Answer:

A. NOAA provided qualitative drought early warnings and impact assessments by cable to AID/Washington (OFDA, African Bureau, etc.), State Department, USDA, intelligence agencies, American Embassies, USAID Missions, and UN agencies (FAO, WMO, UNDRO, etc.) during 1982-84. These qualitative assessments (drought impacts on crops and potential food shortage alerts) were frequently supplemented with special written reports provided at the request of AID/OFDA, during these same years.

B. Rainfall data and other in-country information sources were used by the UN/FAO to monitor and report the drought.

C. NOAA/NESDIS scientists do not believe that either the NOAA/AID or FAO drought early warning assessments were ignored. We do believe that there was a lack of quantitative yield forecasts and other information to alert food security managers of the true magnitude of the food deficit problem. Prior to 1985, quantitative yield estimates were usually not made until 30-60 days after the crop harvest (e.g., FAO/UNEP in-country surveys). The NOAA/AID PASA on Special Climate Impact Assessments for the Sahel and Horn regions of Africa significantly increased NOAA's ability to provide assessments during the crop season. Such assessments can now provide quantitiative millet/sorghum yield forecasts made by administrative regions in 11 African nations. Special assessments also help identify localized drought impacts. Yield forecasts are issued 30 days before harvest operations.

There are other new programs such as FEWS (Famine Early Warning System) being developed by AID to permit detailed analysis of the population and nutrition components of the problem. Furthermore, USDA and AID African Task Forces improved interagency use of information including the active participation of USAID missions.

None of these ingredients, including meteorological satellite assessments, were available prior to 1985. But today they can be the foundation for reliable, timely quantitiative drought early warning for crop forecasting and food needs assessment programs.

Question:

You mentioned in your testimony that coordination between NOAA, USDA, AID, and FAO in monitoring and assessing drought and food supply conditions in Africa could be improved. Please elaborate.

Answer:

Forecasting food supplies/deficits is a difficult task under the best of circumstances. Each agency can contribute unique expertise and information which must be aggregated to make the forecast. Mechanisms such as interagency task forces are needed to provide framework for interagency cooperation. Interagency initiatives to develop and use assessment technology would also improve coordination between U.S. Federal agencies (USDA, NOAA, AID).

Question:

How do we aid the African nations in:

A. understanding their weather;

B. interpreting the predictions we provide; and

C. developing strategies to minimize the impacts of drought on their populations, environments and economies?

Answer:

A. "Understanding weather" requires not only support for meteorologists (e.g., throught the WMO and projects such as AGRHYMET, but also support for the users of weather information (e.g., agronomists, economists, and agricultural statisticians). Understanding weather's impacts on agriculture requires multidisciplinary talent, including interagency and private sector involvement. AISC uses a multidisciplinary team to gain the support of policy makers and promote the interagency use of the technology.

B. Under the NOAA/AID Special Climatic Impact Assessment project, the assessments are provided to decision makers (USAID and host-countries) and AISC representatives visit each country during the middle and end of the crop season to explain the assessments, foster use of the product, and obtain views of host-country representatives.

C. Improved operational information systems (e.g., climate impact assessment and statistical crop surveys) are essential to the development of short- and long-term strategies for effective drought mitigation. Policymakers need reliable early warning information to assess food supplies and make short-term economic decisions. One requirement for improved agricultural policy is better information. Such information systems contribute to agricultural research by identification of problems and provision of data to help research and solve the problem.

Question:

How has information obtained from satellites aided in assessing rainfall anomalies and predicting production shortfalls?

Answer:

During 1985, there have been very dramatic developments in the operational use of daily meteorological satellite data (NOAA 9) to detect drought and assess vegetation conditions in semi-arid regions of Africa. Several new tools for analyzing rainfall patterns and assessing crop/rangeland conditions have been incorporated into AISC's Special Climatic Impact Assessments under the NOAA/AID PASA. These include: the vegetation indices, quantitative precipitation estimation procedures, and biomass indicators. For example, satellite data are being coupled with rainfall reports for more precise rainfall estimation. These reports are provided to organizations such as the AGRHYMET project. Promising satellite vegetation indices and crop yield relationships are also being tested. AISC representatives visiting the project countries and regional centers (e.g., AGRHYMET Center/Niamey, Regional Remote Sensing Center/Nairobi, and UNEP/GEMS Center/Nairobi) have found enthusiasm for this new technology and plans are being prepared for expanded cooperative technical assistance throughout the region.

Question:

Is there any developmental work underway that holds promise for substantially improving the U.S. Government's capability to monitor and forecast droughts and food supply problems?

Answer:

In terms of assessment, the most exciting and promising opportunity involves integrating various technologies to address food shortage forecast problems. These technologies include meteorological satellites and LANDSAT plus aircraft and statistical ground survey systems to detect drought, assess crop/rangeland conditions, forecast production, and identify at-risk populations.

Question:

Do you have any recommendations for legislation, for example to facilitate technology transfer, or to improve our monitoring and assessment capabilities?

Answer:

No. As previously mentioned, a U.S. Government Interagency Initiative to develop and use satellite technologies for drought early warning and climatic impact assessment would be very beneficial. Such an agreement might include USDA, NOAA, NASA, and AID. Scarce government resources could then be most effectively coordinated to solve a difficult, complex problem. This would also improve mechanisms to transfer technology to Africa.

Department
of
Meteorology

University of Maryland
College Park, MD. 20742
(301) 454-2708

CENTER FOR OCEAN-LAND-ATMOSPHERE INTERACTIONS

November 18, 1985

The Honorable James H. Scheuer
Chairman, Subcommittee on Natural Resources,
  Agriculture Research and Environment
Committee on Science and Technology
Suite 2321, Rayburn House Office Building
Washington, DC 20515

Dear Mr. Scheuer:

Thank you very much for your letter dated October 24, 1985 regarding my testimony at the hearing on September 19, 1985 to examine the climatological aspects of African drought.

This letter is in response to the follow-up questions for African climate hearing which were sent along with your letter. I have gone through the background report supplied by the Congressional Research Service and the testimony submitted by the Agency for International Development. My comments on these reports follow:

a) Both the reports, and especially the one by the Congressional Research Service do not draw a clear distinction between monitoring and forecasting. By doing so they have undermined the urgent need for improvements in forecasting. Monitoring is a technical problem, whereas forecasting is a complex scientific problem. These reports give an erroneous impression that substantial work is going on in the area of forecasting. That is simply not true.

   Development of sophisticated models for forecasting is urgently needed, especially to make predictions at various time scales (months to years) and this point is lost in these two reports.

b) One of the most important questions for policymakers is to know whether man's influence (land use practices, etc.) has been a factor in perpetuating the drought. It is only after this question has been answered reasonably well that a policy can be suggested for land use practices. This question needs better treatment and focus in the report by Congressional Research Service.

   Finally, I would like to suggest that prediction of droughts over Africa is only one aspect of the overall problem of climate prediction. There should be a sustained research effort to increase our capabilities in prediction of climate, especially at monthly and seasonal time scales

Division of Mathematical and Physical Sciences and Engineering

for which a scientific basis has already been established. Prediction of droughts over tropical countries should be of great interest to the Department of State and Agency for International Development, prediction of monthly and seasonal temperature anomalies over USA should be of great interest to the Department of Energy, and prediction of rainfall and temperature over the whole globe and particularly over the USA should be of equally great interest to the Department of Agriculture. Therefore, various agencies of the U.S. Government could launch a coordinated effort in climate prediction. Answers to the follow-up questions are enclosed.

I would like to thank you once more for the opportunity to appear before your subcommittee.

Sincerely yours,

JShukla

J. Shukla, Professor
Director, Center for Ocean-
Land-Atmosphere Interactions

JS:law

ENCLOSURES: Answers to follow-up questions

FOLLOW-UP QUESTIONS AND THEIR REPLIES

Question 1: In their written their testimony both Dr. Shukla (page 5) and Dr. Nicholson (page 2) stated that deforestation and desertification caused by misguided land-use practices could result in local or geional climate chage, possibly leading to increased severity of the drought. What are some of the ways man's influence results in local or regional climate change?

Answer: Some of the possible ways in which man's influence can result in local or regional climate change include:

a) Deforestation and overgrazing can increase the albedo (reflectivity) of the land surface, thereby reducing the amount of radiation energy available for evaporation and rainfall.

b) Absence of plants and trees can decrease the amount of soil moisture available for evaporation and rainfall.

c) Removal of trees and plants can reduce the effective roughness of the ground which can influence the convergence of moisture, and therefore, rainfall.

d) Devegetation and soil degradation can increase the runoff and reduce the soil moisture which otherwise would have been available for evaporation and possibly rainfall.

There is a large body of indirect evidence which suggests that the above mentioned mechanisms could work in unison to increase the severity of a preexisting drought. A series of systematic modeling and observational studies are required to determine the relative importance of these factors including, if they play any role at all for the African drought.

Question 2: If man's overuse of land results in increased drought persistence and severity, could the process be reversed?

Answer: Whether the process can be reversed or not will depend upon the precise nature of the physical mechanism which is giving rise to the drought. We are not quite sure whether the increased drought persistence is caused by man's overuse of land or not. Unless we can determine that, we can not answer the second part of the question.

I do not have any quantitative information about the so called "greening of desert" in Israel. Based on my conversations with the scientists from Israel, I understand that during the late 1940's the northern edge of the desert was near Tel-Aviv-Jerusalem, whereas, now the northern edge of the desert is near BeerSheva. Forty years ago there were very few settlements and large number of nomads, whereas now in the same area there are nearly 200 settlements, almost no nomads and no dunes. It is claimed that this has occurred due to massive irrigation and controlled landuse practices.

Can we repeat this process for Africa? I do not know the answer. The only way to give a meaningful answer is to carry out controlled sensitivity experiments with very sophisticated models of the climate system. Such models already exist, the experiments have not been carried out.

Question 3: Should the U.S. support the African weather coordinating centers in order to improve the weather service of African nations, as you outlined on page 7 of your written testimony?

Answer: I would like to reiterate that the U.S. should take a leadership role in supporting and improving the weather services of African nations.

Question 4: In your testimony you outlined a research program to study the variability and predictability of droughts in general, with particular emphasis on the African drought and to help develop the meteorological services of the African countries.

Answer: I would like to recommend that a research program be established to predict the tropical droughts. We should take advantage of the tremendous progress made in this field during the past 10-20 years. This is yet another way that modern science and technology can help alleviate human misery for a vast sea of humanity living in the tropical regions of the globe. It also has the potential of predicting climate change over non-tropical parts of the globe.

Population Crisis Committee

Draper Fund

Suite 550, 1120 19th Street, N.W.
Washington, DC 20036
Telephone: (202) 659-1833
Cable: CRISIS WASHINGTON
Telex: 440450

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Directors Emeriti

Harold W. Bostrom
Cass Canfield

New York Office:
435 East 52nd Street
New York, NY 10022
Telephone: (212) 751-9611

January 7, 1986

The Honorable James Scheuer
Chairman
Subcommittee on Natural Resources,
Agriculture Research and Environment
House Committee on Science and Technology
Washington, DC 20515

Dear Chairman Scheuer,

I would like to thank you for the opportunity to testify at your hearing on October 17 on population pressures in sub-Saharan Africa. Following the hearing, you requested that I submit written responses to several questions for the record. The responses are enclosed.

I must apologize for the delay in responding to these questions. The delay was occasioned by my having to prepare reports for the State Department on the trip that Fred Pinkham and I just made to Bangladesh, the Philippines and Thailand. I always give these trip reports priority attention before the details are forgotten.

I send you best wishes for the New Year, knowing that no one in the Congress of the United States is more dedicated and effective in dealing with mankind's greatest longterm problem than you, Jim.

Sincerely,

Marshall

Marshall Green
Ambassador (Ret.)

RESPONSES BY AMBASSADOR MARSHALL GREEN TO QUESTIONS SUBMITTED FOR THE RECORD

1. Increased awareness of the adverse impact of rapid population growth and receptivity to family planning programs worldwide are largely the result of American leadership over the past 20 years. The US is still the most important source of technical expertise and financial resources around the globe and continues to provide roughly half of the total amount of donor funds available for population assistance.

A.& B. The potential impact on Africa of the termination of support for the International Planned Parenthood Federation (IPPF) and the possible withdrawal or reduction of US contributions to the United Nations Fund for Population Activities (UNFPA) is enormous. In FY 1986, AID has requested $23.9 million for bilateral population programs in 8 African countries. The funding level is a significant increase over the FY 1985 level of $14.6 million, but bilateral aid does not reach the vast majority of African countries. In contrast, multilateral and nongovernmental organizations reach over 40 countries and contribute in excess of $50 million annually.

The small number of bilateral programs combined with the low capacity of African governments to absorb effectively population assistance make multilateral and private funding channels especially critical in sub-Saharan Africa. Moreover, African governments have a strong preference for multilateral or PVO channels, as opposed to bilateral government channels, when it comes to a sensitive field like family planning.

The UNFPA has doubled its level of support for Africa in the last several years and provides invaluable technical assistance to government health ministries in 41 countries (1984) seeking to improve the delivery of maternal and child health and family planning services. In contingency plans prepared in case of the loss of US funds, UNFPA has vowed to preserve its expanding activities in Africa and has alerted program directors in the rest of the world to be prepared for a significant reduction in UNFPA support.

The decision by AID to deny US funding to IPPF has already undermined the integrity of population programs in Africa. In some African countries, one of IPPF's 24 affiliates is frequently the principal or only source of contraceptive information or supplies. Even where governments or other AID-supported private organizations are involved in family planning, IPPF affiliates' facilities or manpower are often the foundation on which other programs have been built. As a result of the AID decision, IPPF will be unable to establish the 13 new African affiliates originally planned for the next three years in countries where no family planning facilities currently exist. In addition, ongoing IPPF programs in Africa will have to be scaled back and new initiatives, such as joint family planning-parasite control projects in several countries, deferred.

Over the next several years, the impact of the elimination or reduction of US support of IPPF and UNFPA is likely to include a rise in birthrates, a rise in infant and maternal mortality rates, and a rise in the incidence of illegal abortions -- a public health problem which is reaching epidemic proportions in many African cities.

2. National government policy and commitment are of key importance in promoting family planning and thereby stabilizing population growth rates. This involves governments communicating to their citizens the necessity of addressing population problems, ensuring the allocation of sufficient public funds for family planning including the training of doctors and paramedics, liberalizing restrictive laws, promoting the status and rights of women, encouraging the involvement of the private sector, and requesting financial and technical assistance from the donor community.

A. Two of the best examples of countries where fertility decreased because of a change in leadership attitudes are Mexico and Indonesia.

In 1973, Mexico's population was growing at a rate of 3.3 percent and was expected to double in only 21 years. But the following year, in a striking change in policy, the government launched what was soon to become a nationwide program with extensive outreach. By 1980, more than 11,000 community health workers were providing a wide range of family planning services in 5,000 centers countrywide, and contraceptive prevalence rose from about 10 percent in the early 1970s to 42 percent by 1981. Mexico's current growth rate is 2.6 percent, and the government provides 80 percent of program costs.

In 1973, Indonesia's population of 132.5 million was growing at a rate of 2.9 percent and was expected to reach almost 250 million by the year 2000. Since then the Indonesian government has established contraceptive distribution centers in every village on Java (where two-thirds of Indonesia's population live) and Bali, and contraceptive prevalence rates in a few areas now approach those of Western countries (60 to 70 percent). Throughout Java and Bali, from the president down to the village family planning volunteers, there is a commitment to curb population growth. Program achievements have not been as great in other parts of Indonesia. The country's annual growth rate has fallen to 2.1 percent, and the new projection for total population in the year 2000 is 210 million, some 40 million less than projected a decade ago. Thus it could be argued that the population program has been largely responsible for averting tens of millions of births, especially in Java which suffers so severely from overpopulation that the government has been trying for years (without much success) to transfer people from Java to Sumatra, Borneo and the Celebes.

It should be noted that in areas often cited by "supply side demographers" to prove the contention that population growth does not hinder economic development (i.e., Taiwan, Singapore, Republic of Korea and Hong Kong), the political leadership instituted strong population policies in the mid-1960s which brought about significantly lower birthrates during their transition to modern, industrial economies.

B. For almost two decades, the US has been in the forefront of efforts to bring about a change in the attitudes of LDC leaders toward population stabilization and family planning. Discussion of the relevance of demographic trends to national development has usually been a subject of discussion where appropriate during the regular process of policy dialogue that goes on between US government officials and foreign aid recipient countries on a wide range of development cooperation issues.

In the last several years, new strategies have been developed to raise the awareness of LDC leadership of the basic relationship between population growth and development and to examine population and family planning issues which affect or are affected by development objectives. One of the most successful AID-sponsored initiatives has been the RAPID project. RAPID consists of the preparation of interactive computer simulation models examining the effects of population growth (at current rates and at lower hypothetical rates) on socioeconomic variables in individual countries which are presented to national leaders and senior government officials. RAPID presentations have been prepared for 30 LDCs to date; and nearly 20 additional countries, with major emphasis on sub-Saharan Africa, are scheduled for the next three years.

In the area of changing the attitudes of husbands, programmatic solutions are likely to avail little. Traditional African societies offer many cultural reinforcements for large families, and in many countries the virility of African men is still viewed as related to the number of children fathered. A change in attitudes will only come in the longer term when male perceptions of women cease to be focused exclusively on childbearing, child rearing and doing menial tasks. Strategies to improve the status of women are critical to this evolutionary process, and AID should expand its Women in Development (WID) program. AID should increase its support for innovative, small-scale projects (including low interest loans) designed to enhance employment and income earning opportunities for women in developing countries in cooperation with indigenous women's groups. Governments should also be encouraged to support women's organizations and cooperatives, especially at the community level. Less direct interventions should include efforts to raise female literacy and reduce infant and maternal mortality.

On the other hand, high unemployment and massive underemployment among males greatly complicate the task of finding meaningful job opportunities for women in Africa.

3. The recent crisis in Africa has had a measurable effect in focusing the attention of African leaders on the impact of rapid population growth rates on their nations, and the crisis has created an opportunity that must not be lost. At a meeting of the planning ministers of the member countries of the Organization of African Unity (OAU) in April 1985, the participants concluded that addressing population problems was the most urgent priority for African nations. Unfortunately, the resolutions on development agreed to at the OAU summit three months later in July were not as strong as those approved by the planning ministers in the area of population and reduced population problems to last place on its list of twelve priority issues. Nevertheless, a mere decision by the OAU heads of state to single out population problems in its declaration was an important symbolic gesture and bespeaks less in political sensitivity of the issue of family planning among African leaders. It is probable that the failure of donor country media and officials to place adequate emphasis on excessive population growth as a major basic contributory factor in Africa's famine and drought resulted in African leaders giving less attention to population issues than would otherwise have been the case.

4. The World Bank and the other multilateral development banks should be doing more to stimulate loan applications from developing countries for the financing

of family planning. For the last several years, the top leadership of the World Bank has shown an increasing commitment to doing more lending in the population field. For example, the World Development Report in 1984 was devoted exclusively to a discussion of population growth as it affects developing countries. Unfortunately, this emerging high level commitment has not been translated into interest and action at the operational level among program managers in the regional bureaus responsible for most of the bank's lending.

Consciousness-raising is an activity in which the World Bank can and should play a major supportive role. Bank officials are beginning to recognize that they have a unique opportunity and responsibility to educate LDC leaders on the impact of population growth on the prospects for achievement of their development objectives during the ongoing policy dialogue.

It is important to note that one of the principal reasons for the low level of borrowing for family planning from the MDBs is that LDC leaders are reluctant to take large-scale loans to finance what is perceived to be an unproductive investment that will not generate the resources required for the repayment of loans. However, LDC leaders often fail to take into account the tremendous savings in social service expenditures over the long term associated with reduced population size in the areas of education, health care, and housing. For example, a 3 percent growth rate in the population of school-age children requires a doubling of school facilities every 23 years just to maintain rates of enrollment. The World Bank and the other MDBs can play a critical role by illuminating these linkages and pointing out the longterm benefits of investments in family planning.

5. A. No population "safety valves" exist for Africa similar to the migration to America during the industrialization of Europe. There are few Africans who migrate outside of the continent other than students, and those that do are frequently greeted with a less than hospitable reception. At one time there was a strong demand, especially in Europe and the Gulf States, for overseas workers but this is declining and never included many sub-Saharan Africans. Most areas of Africa have either been settled or are unsuitable for habitation.

B. The reasons for high rates of migration to African cities are economic. The factor that may limit migration to the cities is the achievement of sustainable development in the rural areas. The provision of family planning services should be an integral part of any comprehensive rural development strategy.

Some African governments have also adopted policies that attempt to spread massive urban growth around the country. Nigeria's planned new capital city of Ajuba is largely motivated by a desire to diffuse the explosive growth of Lagos. Kenya's policy is to promote market-towns throughout the country to reduce pressures on Nairobi and Mombasa.

Columbia University
CENTER FOR POPULATION AND FAMILY HEALTH

The Development Law & Policy Program

60 Haven Avenue
New York, N.Y. 10032

Telephone (212) 305-6971
Telex Poplamhlth 971-913
Cable Pophealth New York

December 13, 1985

Congressman James H. Scheuer
U.S. House of Representatives
Subcommittee on Natural Resources,
Agricultural Research and Environment
Washington, DC 20515

Dear Congressman Scheuer:

Thank you for your letter of November 22 and the follow-up questions to my testimony of October 17. I appreciated having the opportunity to testify before the committee and am pleased to have this chance to elaborate on that testimony.

The first question that you raised relates to the effect of reduced United States population assistance on family planning programs in the developing world.

First of all, let me note the paradox that just as many leaders of sub-Saharan African countries are recognizing a population problem, funds to international organizations such as the UNFPA and IPPF are being cut. Given the deterioration of African economies and the scarcity of foreign exchange, even in oil-producing countries such as Nigeria, it is evident that foreign assistance will be necessary to help those African countries wishing to reduce their population growth rates. The major donors are the U.S. Agency for International Development, the World Bank, the United Nations Fund for Population Activities (UNFPA), and the International Planned Parenthood Federation (IPPF). Funds to IPPF have been slashed; the UNFPA has had its funds reduced and AID is not, according to my information, planning to increase its funds for population activities in sub-Saharan Africa.

This leaves only the World Bank, which by and large, lends money at commercial interest rates. Many developing countries, worried about guarding scarce foreign exchange and already burdened with problems of debt servicing, are unwilling to accept loans at commercial interest for projects which do not have a major impact on the physical infrastructure.

One case in point is Nigeria. The current chief of state and his pred-

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Faculty of Medicine
International Institute for the Study of Human Reproduction
School of Public Health

ecessor both have spoken extensively on the need to reduce Nigeria's population growth rate. The World Bank, the UNFPA, AID, and several non-profit organizations (including our own) have assisted the Nigerian government's efforts to develop a population policy and to begin programs. However, just at the time that the policy has been drafted and new programs may be started, it appears that funds to carry out these activities will not be available from international sources. The UNFPA is hesitant to make any commitments given the uncertainty of its situation. IPPF can give only limited help to its affiliate in Nigeria. AID is unlikely to increase its resources, thus leaving only the World Bank as the major donor. It leaves us in the position of having supported policy and program change but not being there when funds are needed.

Your second question concerned the role of leadership groups and policy in promoting family planning and lowering fertility.

There are a number of examples where changes in the attitudes of government leaders have influenced fertility decline. Among them are Mexico, China, and Tunisia. In Mexico, for example, President Echevarria reversed a long-standing pro-natalist policy in 1974. That same year the Mexican Parliament passed a population law which promoted family planning and established a goal of population stabilization. As a result, a national population council was set up, a major family planning program, reaching even remote rural villages, was undertaken; sex education was taught in the schools, and population education promoted in mass media. In my opinion, this policy and the programs which followed it made access to contraception much more readily available in Mexico; this in turn was largely responsible for the rapid decline in fertility that has taken place in Mexico since 1974. Tunisia, too, might be an instructive example. As early as 1956, President Bourguiba promoted legislation that improved the status of women and made contraception, sterilization, and abortion legal and available in Tunisia. He made many speeches in favor of smaller family size thus setting a tone for the government, and indeed, for the nation as a whole. Tunisia's fertility decline since the 1960's is due in part to these progressive government attitudes of the country's leaders.

I would note that population policy is not necessarily "the answer" to reducing population growth. There have been countries, such as Costa Rica and Chile, where fertility has declined without an explicit population policy. There have also been cases where population policies have been announced and have not been vigorously implemented. An example would be Peru's failure to implement its 1976 policy. However, population policies can be important as an expression of government policy and will. They establish a climate whereby family planning becomes more acceptable and lower fertility becomes the acceptable norm.

Your third question asked what the international donor community could do to stimulate applications to the World Bank.

I believe that the World Bank has to help itself before the international

. . .

donor community can step in. They can do this by practicing what I term the "3 S's" -- smaller projects, soft loans, and specialists' assistance. The World Bank has, in part, established its reputation by funding big, showy projects. Money spent for family planning, training, information, and the like does not have the pizzazz of constructing a big dam. The World Bank, however, should be willing -- and make it widely known that it is willing -- to fund a large number of smaller projects. High interest rates scare potential recipients off; if more money were available on softer terms (even as grants), there certainly would be more demand for funds from the World Bank. Finally, the Bank could send more specialists to make the argument that loans for family planning are cost-effective in the long run and to help countries develop projects. This has been done to a certain extent with the promotion of the 1984 World Development Report, but a great deal more effort could be made in this regard.

The fourth question asks what effect the drought has had in focusing attention of African leadership on population growth problems.

Two factors have forced African leaders to recognize the problems of population growth. The first is the drought. Throughout the Sahel region, it has caused starvation and malnutrition, thus forcing rural people into the cities (or to neighboring countries), and in general disrupted the economy of a number of countries. The other factor has been the deterioration of the national economies and the loss of foreign exchange. These were responsible for the recent pronouncements about population growth in the formerly pro-natalist countries of Niger and Mali. Economic stagnation and a drop in revenues from the export of oil forced Nigeria's leadership to recognize that population growth must be reduced for the country to successfully confront its development problems.

The final question asked whether the former colonial powers, namely the French and the Belgians, are assisting their former colonies to change restrictive family laws.

The answer is no, they are not. To the best of my knowledge, only groups funded by AID have been assisting former French and Beligan colonies to examine and revise those restrictive laws inherited from the colonial period.

If there is any other way in which I can be of assistance, please do not hesitate to contact me.

Sincerely,

Stephen

Stephen L. Isaacs, J.D.
Director
Development Law and Policy Program

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HUNGER IN AFRICA HEARINGS

RESPONSE TO FOLLOW-UP QUESTIONS

WERNER FORNOS, PRESIDENT
POPULATION INSTITUTE

1.

Ques. How important is national government policy to promoting family planning and thereby stabilizing population growth rates?

Ans. We have more experience with family planning programs and policies outside Africa than inside, so let me start by talking about Asia and Latin America.

In many countries national government policy, or more directly, indigenous political commitment, has been extremely important to the success of family planning programs. Where you have political commitment, motivation for smaller families and universal availability of contraceptives, then birthrates will decline. Some examples are Indonesia, Thailand, and Mexico.

In Indonesia, the Family Planning program is strongly supported by the President who does not hesitate to use his power to insure the adequacy of program inputs from government ministers and provincial governors. On the other hand, there are cases where substantial progress was achieved without strong political commitment. In Brazil, for example, private family planning organizations with funding from international sources and the pharmaceutical industry succeeded in raising the family planning use rate above 50 percent. Oral contraceptives, for example, are available without prescription in retail drug stores for the equivalent of 25 to 50 US cents.

In Africa, the best example of strong political commitment is probably Zimbabwe. The family planning director, Ms. Esther Bohene, is Prime Minister Mugabe's sister-in-law. Both Mrs. Mugabe and Ms. Bohene spoke out forcibly at the UN Women's Conference last July on the need for Africa to act on family planning, both in the context of individual rights to plan the number and spacing of children and the implications to national welfare. Mrs. Mugabe spoke forcibly about the need for men to take responsibility. Zimbabwe has the highest family planning use rate in Africa and the program is expanding.

Kenya is another African country with strong political commitment. Both the President and Vice President speak out frequently and loudly.

In August, just after the Women's Conference and just before a Papal visit, President Moi announced a goal of reducing fertility from eight to four children per couple.

One of the most effective organizations in Kenya is the women's organization, Mandeleleo Ya Wanawake which has community development programs including family planning throughout Kenya. It focuses on direct personal contacts with both women and men in rural areas, using community picked village leaders.

1. (A)

Ques What programs should we encourage to change the attitudes of men -- both husbands and chiefs of state -- in order to interest them in family planning and support women who wish to engage in family planning?

Ans The economic and political situation in Africa is probably doing more to prod heads of state into action than anything the United States could do or say. High fertility means that 40 to 50 percent of African populations are less than 15 years of age. As these young people reach working age over the next several years, the demand for jobs will be staggering. Africa needs to double the number of jobs approximately every 20 years. If they fail to provide meaningful employment, the prospects are high for civil unrest and the rise of extremest political factions on both the left and right.

The United States can help most by rapidly expanding resources for family planning along the lines outlined by the Committee on African Development Strategies. On the individual level, the economic situation may again be the prime mover. Education programs aimed at making men aware of the consequences of high fertility for them as well as their families can be effective. Involvement in community development activities such as those provided by Mandelelec Ya Wanawake are important.

Ques. 2. What effect has the drought had in focussing the attention of African Leaders on the tremendous population growth rates of their nations?

Ans. The response by African leaders to the drought and ensuing famine situation varies from country to country and does not necessarily reflect heightened awareness of the dangers of overpopulation. Ethiopia, for example, has accepted famine relief but her actions do not indicate a pressing concern for long range solutions such as family planning and agricultural reform. Nor do the relief agencies or international organizations seem to be stressing the importance of effective family planning.

Leaders in other African countries, however, understand very well the dire situation they are in. In addition to Kenya and Zimbabwe which were discussed earlier, Nigerian leaders view food security as a major national concern.

Ques. 3 African countries are reluctant to borrow to finance family planning programs. What can the international donor community do to stimulate applications from sub-Saharan countries for family planning programs?

Ans. Countries are generally reluctant to borrow money to finance social programs because they can not see a direct connection between that spending and the generation of income to repay the loans. Perhaps if the connection were demonstrated with models, more leaders would see that financing family planning with borrowed money is financially sound.

On the other hand, developing countries already owe substantial sums that are well beyond their ability to repay. Some countries are faced with the impossible choice of financing imports of food and petroleum or paying debt service. If they fail to cover debt service, international banks will not extend future credit. But if they fail to import food and petroleum, they will invite famine and economic stagnation.

If the donor community were to follow the recommendations of the Committee on African Development Strategies with respect to family planning, the problem may be solved.

Population
Crisis
Committee

Draper Fund

Suite 560 1120 19th Street, N.W.
Washington, DC 20036
Telephone: (202) 659-1833
Cable: CRISIS WASHINGTON
Telex: 440450

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Directors Emeriti
Harold W. Bostrom
Cass Canfield

New York Office:
435 East 52nd Street
New York, NY 10022
Telephone: (212) 751-9511

February 25, 1986

The Honorable James H. Scheuer
Chairman
Subcommittee on Natural Resources, Agriculture
Research and the Environment
U.S. House of Representatives
Committee on Science and Technology
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Scheuer:

Enclosed you will find a response to the questions you submitted to me in late 1985 in response to your request to elaborate on the issues raised at the Hearing on the Effect of Population Pressures on the Environment and Development in sub-Saharan Africa.

1. To what extent has U.S. leadership brought about change in population policies in developing countries?

   Although hard proof is lacking there is substantial circumstantial evidence to indicate that U.S. attitudes concerning the importance of population and family planning programs have a substantial impact on population policy development in Third World countries including those in sub-Saharan Africa.

   A. What will be the effect of recent changes in U.S. foreign population assistance policy (decreased support of the United Nations Fund for Population Activities and the termination of support of International Planned Parenthood Federation) on population programs in sub-Saharan Africa?

   In the past, U.S. leadership coupled with offers of technical assistance and financial support for population programs including those of the UNFPA and IPPF has been highly important in speeding the development of both needed policy changes and family planning programs. IPPF and the UNFPA are the most important sources of family planning support in much of Africa and cutbacks are already compromising programs in Africa.

   B. Has the current population funding reorganization in the United States damaged the credibility of population programs in sub-Saharan Africa?

   Political leaders and development experts in sub-Saharan African countries are confused by the ambivalent messages provided by the U.S. government. For example, U.S. policies announced in Mexico City said, yes we support family planning but it isn't very important and besides free market economic systems are really what matters to solving population problems. This was followed by down playing this issue at the International Conference for Women in Nairobi. U.S. actions have left many African leaders confused about what is the real U.S. position with respect to the priority that ought to be given to population issues. In short, I believe U.S. population policies which have included anti-abortion rhetoric, a cut-back in funds and a general denigrating of the importance of population and family planning work has had a direct deleterious impact on the population programs in sub-Saharan Africa.

2. Werner Fornos addressed in his testimony the recent trend in administration policy toward more extensive support of natural family planning. Please explain the role you feel is appropriate for the natural family planning method in sub-Saharan Africa.

Natural family planning has been relatively unsuccessful in Third World countries. A very small proportion of individuals wish to practice this method. Drop-out rates are high, often averaging 50% in the first year of use, and failure rates among users typically range from 10-30 pregnancies per 100 women in one years use. Although natural family planning through periodic abstinence is one of the least appropriate methods of family planning for sub-Saharan Africa it is better than no family planning and is acceptable to a small number of couples. Therefore it should be encouraged but placed in a realistic context of its effectiveness and acceptability.

Another "natural" method of fertility regulation, not commonly considered natural family planning, is full lactation. Encouragement of breastfeeding has a beneficial impact both on delaying return of fertility and improving infant health. This method of family planning is highly appropriate for every developing country and should be encouraged. It should also be noted that some traditional practices such as total abstinence for a year or two after child bearing are dying out. A value judgement concerning their appropriateness would have to be left to the cultural groups involved.

3. Ms. Harris stated in her testimony that governments could encourage family planning by lifting duties and restrictions on contraceptives.

A. What other steps should governments take to encourage family planning?

Successful family planning programs are most likely to succeed if governments and other influential leaders within a country create policies favorable to family planning. Equally important is establishment of access to both family planning knowledge and services needed to make them truely available to couples. This includes broad provision of information about the pros and cons of family planning and the characteristics of each contraceptive method, convenient low cost or free services for those who cannot afford them, and convenient provision of service through networks including household distribution systems and commercial retail sales. Such service programs must offer a broad variety of family planning methods because emperical evidence indicates that a broad array of methods will provide at least one method which appeals to an individual or couple. Access to adequate supplies of high quality contraceptives is also important. To make such a program work, adequate emphasis must also be given to the training needed to ensure that high quality services are available to the populous.

B. How important is national government policy in promoting family planning and thereby stabilizing population growth rates?

In Third World countries, where governments dominate political and economic activity to a greater extent than they do in Europe or North America, the position of national governments with respect to population and family planning is very important. Governments can promote, legitimize and often are needed to provide family planning services. Government opposition or indifference, constitutes a serious problem for population and family planning programs in Third World countries.

C. Could you give examples of nations where fertility decreased because of a change in leadership attitude?

A striking example is Mexico where a decade ago President Lopez Portillo decided to implement a family planning program. In this middle income nation, which had experienced substantial economic progress, there had been virtually no change in high fertility until a vigorous family planning program was implemented with active government support. More gradual change to favorable national government policies has occured in countries as varied as South Korea, Colombia, Thailand, Bangladesh, India and China. All of which have made substantial progress in reducing high fertility rates.

4. Miss Harris stated in her testimony that there is a demand for male contraceptives in this region.

A. Are male attitudes changing toward family planning in sub-Saharan Africa?

In sub-Saharan Africa there are some 40 countries with vast differences in culture, educational attainment and modernization. So it is not easy to generalize with regard to male attitudes. However, given this vast diversity it is possible to note substantial changes in male attitudes in some countries and among certain groups. In particular, the leadership groups in many African countries have recently spoken of family planning in terms beyond birth spacing for health purposes, and have recognized that economic progress is dependent upon slowing rapid population growth. The values of government, political and business leaders are most likely to be reflected in attitudes of urban elites. But even less well educated rural males facing economic hardship are beginning to face up to the needs for family planning and decreased population growth rates.

B. What are some of the hindrances to male contraceptive use and acceptance of family planning?

The broad array of pro-natalist cultural patterns in Africa may include: less individual responsibility for child rearing (an adult may be equally responsible for his tribe's or his brother's children), expectations of at least four children, perceived economic benefits of children, etc. In general many cultural practices and beliefs are strongly pro-natalist. However, the largest barrier to increased use of contraception by males is lack of high quality services including adequate information about the benefits of family planning and the pros and cons of individual contraceptive methods.

C. Would development of a different type of male contraceptive such as a pill, encourage male interest in family planning.

The history of family planning indicates that improved contraceptive technology has the potential for dramatically increasing use of contraception by making contraceptives more convenient, less expensive, easier to use, safer and offering greater freedom from side effects. For example, introduction of pills and IUDs dramatically increased the number of contraceptive users and the effectiveness with which contraception was used in many countries and cultures.

D. What program should we encourage to change the attitudes of men — both husbands and chiefs of state — in order to interest them in family planning and "permit" the women to engage in family planning?

> A fundamental problem facing many African nations is ignorance of the implications of rapid population growth and the contribution that family planning can make to individual decision-making, health, and economic status. The demographic facts, the concept of demographic momentum, knowledge about the interelationship between economic growth and rapid population growth, the interaction between population growth in such areas as food, jobs, national security and ecological damage is only dimly perceived. Also lacking is understanding at the individual level of the health benefits, the expansion of choices with regard to the number and timing of child bearing and the familial economic benefits that family planning can bring. To change the attitudes of rank and file men as well as leaders requires a great educational effort based on both increased research and data collection and innovative programs of marketing this information to make it more readily available and to ensure that it is assimulated and becomes a part of the "conventional wisdom" of African men.

My apologies for this very late response. Unfortunately the incoming letter was lost in the office over the Christmas holidays.

Sincerely yours,

Joe

J. Joseph Speidel, MD, MPH
Vice President

JJS:gd

Hunger in Africa:

(Population;Answers to follow-up Questions)

by Virginia Ofosu-AMaah

1. - In the past 12 to 15 years, the US has played an important leadership role in encouraging family planning in the developing countries through regular annual increases in US family planning aid. The work of the IPPF, the Population Council and USAID in developing countries has helped greatly in creating awareness, training family planning personnel, undertaking research in demography and family planning methods. These organizations have also assisted in the implementation of family planning programs. They have thus been very influential in the move to get the governments of developing countries to understand and appreciate the importance of the population problem.

   A. Recent changes in US foreign population assistance policy has caused dismay and incomprehension among policy-makers in Sub-Saharan Africa (SSA), since these changes are being made at a time that many African countries are beginning to change their attitudes towards family planning. These changes are bound to affect adversely population programs because the impetus and funding that have come from the US will be lacking. The effects will be felt not only from the point of view of the difficulties with expanding existing programs or starting new ones, but also from the point of view of maintaining existing programs.

   B. Personally, I doubt if the current population funding re-organization in the US has damaged the credibility of population programs in SSA. The re-organization, I feel, has damaged, to some extent, the credibility of the US especially because of their past leadership role in this important area.

2. The natural family planning method will be culturally unacceptable to many African women. I-do not therefore see this playing an important role in population programs in Sub-Saharan Africa

3. A. Other steps which governments could take to encourage family planning could include the subsidisation of contraceptives by governments; the institution of incentives for couples which limit their family size - e.g. granting maternity benefits up to a specified number of children; limiting income tax deductions to a few births; where community organization is strong, rewarding communities that are able to recruit a large number of acceptors and show high continuation rates.

B. A national population policy is a sine qua non for the promotion of family planning. Without an articulated national population policy, the commitment or support required from policy makers/heads of governments to boost demand for family planning will be lacking. For such a policy to be put in the right perspective, it would be desirable if it could form an essential and integral part of the National Development Plan and if it could have an explicit demographic purpose. In Latin America, population policies have helped to reduce fertility. In Colombia, for example, public support and the encouragement of private family planning programmes facilitated fertility decline by about one-third between 1970 and 1980.

C. One example is Brazil where the official pronatalist view was changed during the 1974 World population Conference and at the same time in its Second Development Plan. The Government recognised its responsibility of providing family planning services to those who wanted to plan their families but were too poor to pay for the services available through the private sector. Federal authorities gave approval for a number of state-level family planning programs. By 1984, family planning has been integrated into maternal and child health services. The outcome has been a growing awareness of Brazil's population problem even among those who were formerly not in favour of family planning, a growing social demand for family planning and a fertility decline of about 20%.

In Ghana, it was possible to formulate a population policy for fertility reduction in 1969 only after the fall in 1966 of President Nkrumah who was pronatalist. The Ghana fertility survey indicates that there has been a small recent recline particularly within the last 5 years.

4. One only has to examine the debt service profile of countries in SSA to understand why they are reluctant to borrow to finance family planning programs. The World Bank estimates that the total of Africa's "disbursed public and publicly guaranteed medium and long-term debt at the end of 1982 was over $ 48 billion, the majority of it on non-concessional terms". This means that interest rates have been high and re-payment periods short. The ability of African countries to service their debt is weak and debt servicing has therefore been a major problem facing these countries especially because of dwindling external resources which also have to be used for the importation of food and other requirements. Debt service payments are expected to increase dramatically from 1984 onward because of re-schedulings in the last few years. The debt service outlook is predicted by the World Bank to be dismal for SSA. It is therefore not surprising that African governments are wary about obtaining loans to finance programs outside the "productive" sectors.

Since family planning is considered a "soft" sector and does not directly generate income which can be used to amortise any loans and considering the fact that the economies of most African countries are on the decline in the face of an increasing debt problem, it is important that family planning programs are financed from grants. This is the surest way of promoting family planning in SSA by the US and other donors.

Secondly, the international community should continue to bring to the attention of African governments, the interrelationships between population growth and development and the urgent need to reduce the high population growth rates prevailing in their countries.

5. A. Until recently, males have been largely excluded in many family planning programs, However, in those programs in which male participation has been encouraged, the response has been quite good, e.g. the Danfa Project in Ghana. In the African context, the need to involve males in family planning cannot be over-emphasized since in the traditional setting, males are usually the decision-makers in the family.

A rapid change in male attitudes towards family planning can be achieved if males have the knowledge about family planning and are made to understand the pros and cons of having large families. So far, the propagation of the family planning "message" has been very limited in Africa and has not reached most males. This may be one of the reasons for the low rate of contraceptive use in Africa.

B. The major hindrance to male contraceptive use is the unavailability of a suitable and convenient contraceptive for males. The condom is the only male contraceptive available and most African men find this rather inappropriate.

Secondly, an obstacle to male acceptance of family planning is the fear that their wives may be promiscuous.

C. The development of a different type of male contraceptive could encourage male interest in family planning - at least this would make it possible for them to have a choice of method. It is important to note that whatever male contraceptive is developed, its effects should be reversible.

D. The most important program which should be encouraged to change the attitudes of men - both husbands and chiefs of state - towards family planning is information and the promotion of family planning. This could be done in work places, men's clubs or social gatherings.

For husbands in the rural areas who have no access to the information available to husbands in the urban areas, it would be necessary to identify males in the rural areas who are favourably disposed towards family planning to be trained and to be involved in the education and distribution of contraceptives.

6. The recent drought has definitely brought into sharper focus the population problems facing Africa and although African leaders would want to do something about the problem, they lack the wherewithal to do this. This is the time for the US and other donors to come to their assistance and to ensure that the problem is tackled effectively.

7. There is no single effective way of decreasing desired family size and reducing fertility in SSA. The problems in the Region are rather complex and therefore call for an integrated approach. I therefore feel that the most effective ways would include:

   a) Improving the status of women. This should include female education, provision of income-generating activities, provision of appropriate technology (i.e. improved tools and equipment) for farming purposes to reduce dependence on child labour;

   b) Sensitizing, in a systematic way, young people at an early enough age on their fertility behaviour, population questions and implications of population growth so as to influence their attitudes to family size norms;

   c) Improving maternal and child health;

   d) Providing knowledge about family planning and making family planning services easily accessible to both males and females.

INTERACTION
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WASHINGTON OFFICE
JAMES H. SCHEUER, M.C.

January 5, 1986

The Honorable James H. Scheuer
Chairman
Subcommittee on Natural Resources, Agriculture
Research and Environment
Committee on Science and Technology
U.S. House of Representatives

Dear Congressman Scheuer:

Your letter of November 22nd contained a fine series of questions, in follow-up to my testimony before your committee. The questions are complicated and somewhat difficult to answer in an appropriate length. Yet, given the importance of the subject, I will make a valiant attempt to do so and hope that you will be pleased with my suggestions.

Please accept my best wishes for a fine 1986 and I look forward to working with you and your staff in the months to come.

Sincerely,

Perdita Huston
1754 Kilbourne Place, N.W.
Washington, D.C. 20010

additional comments: Perdita Huston

Under the heading Hunger in Africa: Women in Development, the questions are as follows:

1. How important is national government policy in establishing the role of women and in promoting family planning in sub-Saharan Africa?

PH: All important in both cases. The role of leaders in African nations -- which are in transition from a subsistence, traditional culture to a semi-modern economy -- is crucial in all aspects of national life. Rapid social or economic change needs leaders to avoid undue disruption of the social fabric; the more rapid the change, the more important the role of leadership.

If African women were to be recognized for their key agricultural, economic and social role, in public, by leaders and government policy, women's role, productivity and participation in national development would be greatly enhanced.

(For some reason, however, public recognition and support of women's productive roles is not a common occurence in most societies, including our own.)

The same leadership element applies to the field of family planning. Again, publically expressed support by leadership is a key to acceptance of "new" methods of birth control and, especially, to the changing male attitudes toward female fertility. There are many cultures in which the greater number of children a man fathers, the more "manly" he is considered. The pressure on his wife, or wives, to constantly bear children is all encompassing. If she doesn't comply, she can be divorced, beaten, repudiated, etc. She is obliged to have as many children as she can to prove her husband's "manhood".

If leaders of African countries are serious about family planning programs, they must abandon the fertility = manhood conncept and redefine manhood as a man who cares for his family, wife and children and provides well for them.

President Bourguiba of Tunisia, twenty years ago, attempted to do just that. It worked. "Men who have lots of barefoot children are not men -- they're just rabbits", he said. "A man is a person who puts shoes on the feet of his children, food in their stomachs, love in their hearts and education in their heads. If you can't provide these things for your children, you are no man." (I am paraphrasing here.)

The result was immediate: those who had large -- poor --

families were ridiculed; family planning programs caught on fast.

Unfortunately, in many countries it is the leaders themselves who set poor examples. How can a President who has several wives and even more mistresses -- and countless children -- ask others to refrain from doing the same?

Unless information programs by leaders, themselves, become part of family planning programs, I doubt that women will be free to use contraceptive methods. Whether we like it or not, it is the husband who controls this decision in most cases. And men only take advice from men whom they respect...or fear.

A. What laws and policies are especially damaging to the status of women? What role has polygyny played in determining the status of women in Africa?

PH: It is more than likely that the absence of laws is what is damaging to the status of women. Most women's lives are controlled by customs which define age of marriage, dowry or bride price, inheritance rights, right to divorce, etc. The legal codes of most nations have yet to define these "rights" (and if they do, the rural woman is usually uninformed about her leagal status) and, thus, women remain unprotected by law and dependent upon their families, i.e. menfolk to define their existence. The very thought of even choosing one's own husband is a unattainable dream to most women.

Polygyny, I have heard many women say, is a barrier to family planning because if a woman doesn't bear as many children as the husband wishes, he will simply go out and get another wife, which would entail sharing the land owned by the husband with another woman -- and her eventual children. So it is that women who might otherwise prefer to limit the size of their families, continue to have many children to protect their land and their children's welfare.

B. Could you give examples of nations where fertility decreased and the status of women improved because of a change in leadership attitude?

PH: As mentioned above, President Habib Bourguiba of Tunisia was an outspoken leader of his people from the time of Tunisia's independence. He spoke publically about the need for all citizens to contribute to the country's development -- " and that means women and girls". He called for the schooling of all children boys and girls. He told parents that young girls should no longer wear the veil, saying it was a custom which would keep them from participating in the development of the country. He designed a legal code which made it possible for women to ask for divorce, to inherit property, to vote and to run for office. He outlawed wife-beating. (Whereas in the Kenya today, by vote of Parliament, it is considered "customary to beat one's wife".

I don't believe Western donors -- and the US of course -- put enough emphasis on the role of leadership when talking with African officials about foreign assistance.

Unless those who can change the laws are willing to do so, women will be dependent on pleasing the menfolk of their families and that, in turn, will keep them in a subservient, child-bearing role. The success of family plannning programs resides in the education and attitudinal change of men.

C. What programs should we encourage to change the attitudes of men -- both husbands and chiefs of state -- in order to interest them in family planning and "permit" women to engage in family planning and to improve the status of women?

PH: When talking with national officials in Africa, it should made clear at the outset that development assistance is predicated on the social and economic development of the entire society, that certain classes (or a single sex) be singled out as the only beneficiaries of development programs is unacceptable. If USAID officials were clear in their own minds about the needs of a given country in terms of population programs, participation of women in food production and the economy, and the social change that is taking place, they might be able to influence and/or suggest programs which are more effective in attitudinal change.

My experience has led me to believe that USAID program managers are often oblivious to the economic and social roles of various groups in the society they are hired to aid. Perhaps we should train our own officials first, then designing programs for other countries would be more productive.

My belief is that when an individual -- official or peasant -- becomes aware that certain policies/programs are in his/her self-interest, acceptance comes readily.

Quite unbelieveably, we have not adequately documented the economic role of women in any society of the world.... it remains to be done. Until we do, there will be few who will pay attention to women as a resource that should be trained and nurtured as a full participant of society.

When policy-makers begin to understand the "resource", they will pay more attention to it and its needs.

2. Referring to Blaine Harden's extremely perceptive article in the Washington Post, July 6th:

A. How has the status of the rural African woman been diminished over the past several decades?

She has been left out of the change process. Programs were not designed to include "invisible" women. In the Western view, she was only a child-bearer; programs were designed exclusively for "active" males.

When men left the land to find employment, she had to undertake the traditional male role as wellas her own daily tasks. The introduction of cash cropping on the husband's land, and the labor she was obliged to furnish there, prevented her from growing the food the family needed on her own plot. And yet the cash was kept by the husband which, in many African societies, is customary. She had, thus, less food and little cash with which to buy any.

In societies where cash was unknown a generation ago, the need for cash and thus undertaking activities to earn it, put additional pressures on rural women. They wanted progress for their children: school costs money, shoes cost money, medicine costs money, bus rides cost money. And where was a poor, illiterate, and often abandoned rural woman to find cash?

Over and over again, I have heard women say that progress has not been good for them: " life is more difficult than before because we have been left behind".

B. In particular, how have African women been affected by the environmental degradation and the widespread drought, the acceleration of population growth rates, and the migration of males to the cities in search of work?

Long before the drought, long before we began to realize the dimensions of the environmental chaos of Africa, women were saying they wanted to have fewer children....

" because there are so many people now, the land has been divided too many times and there is not enough land to feed many childrem.."

" because children don't die as much as before. If I have 12 live births like my mother, I'll end up with 11- 12 children and I can't feed that many. In my mother's time, out of 12, only three survived to adulthood."

African women knew long ago that too many people meant chaos: for the land, for food, for a decent living. But no one listened to them, for they were, after all, illiterate and poor and "only women". But their predictions have come true. More people means environmental pressure: more fuel is needed, more water for more herds and humans, more cash. Trees are cut, water sources overtaxed, and men leave the land in search of money.

A year ago in Togo, Tanzania and Burkina Fasso, I heard women saying that water was not their biggest problem -- fuel was the great question mark of their lives. " When I go out to look for firewood I don't know when I'll be back, we spend whole days searching for a few branches.

It should be noted that in the convesations I have had with African women about husbands who have migrated to the cities, I found that the large majority of women received no support from their husbands. Once they left, they left -- and came back just once in awhile to give the wife another pregnancy. "Usually," the women say, "the man finds another woman in the city and spends his money on her and her children. He comes back only to check on the land and how well we are producing. And he takes the money we have earned."

C. Do you think development projects should incorporate education on fertility control?

Yes. And on environmental issues -- and on women's roles -- and on community participation -- and on training.

Until we begin to make the linkages between population, environment and development in ALL our programs -- be they development projects, public education, economic stabilizaton or the like -- we are whistling in the wind. And we are abandoning the farmers of Africa.

Perdita Huston

WHEATON
COLLEGE
NORTON, MASSACHUSETTS 02766
(617) 285-7722

December 5, 1985

Congressman James H. Scheuer, Chairman
Subcommittee on Natural Resources
Agriculture Research and Environment of the
U.S. House of Representatives
Committee on Science and Technology
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Scheuer:

Thank you very much for your letter which I have just received. I will attempt to respond to your questions very briefly. I am sure you are aware that to do justice to them would take a Ph.D. thesis. However, as you want the answer by Friday December 6, I am going to be brief.

Sincerely,

Christine Obbo
Assistant Professor
Department of Sociology/
Anthropology

CO/nhs
Enclosure

Hunger in Africa: Women in Development

Follow-up Answers
from Christine Obbo

1. As far as I know the women in Africa have created strategies for establishing their roles despite government policies. With or without official family programs women show great responsibility in spacing their children.

   A) The modern laws regarding marriage, civorce, the custody of children and property rights affect women adversely because they restrict women contrary to Western perceptions, women in polygymous marriages enjoyed more freedom. For example, women actually had less children and had less economic burdens as they shared work with other women. Monogamy has burdened African women with constant pregnancy and as unaided producers.

   B) I am not familiar with policies promoted by specific national leaders that have improved the status of women. I know that in many countries women have had to play a leadership role in whether reducing fertility rates or improving their status.

   C) Policies that demonstrate the viability of small families would be influential. It needs to be demonstrated through the improved health and education of the children who would then enjoy well paid jobs - and adequately support their aging parents.

2. I am not clear what Blaine Harden means by African women being "yoked to a traditional culture that keeps them pregnant and powerless." All available evidence suggests that what yoked African women was not "traditional culture" (whatever that means), but the incorporation of Africa into the international economic system that extracted agricultural raw materials for western manufacturing. Subsistence farming is partly a result of the under-development of African Economies by foreign demands. For example, Western capital has encouraged the employment of men while the women are left to subsidise the wages by growing cash crops and food for the underpaid workers in the cities. Journalists must stop blaiming "tradition" or "culture" for which they have little understanding. Instead I suggest they focus on the real causes that cause the oppression of African women. The so called "traditional culture" was a creation of Colonial domination which changed people's relationships to each other and how they did things. In fact there is no traditional or cultural matter at issue.

   A) Over the past several decades the status of African women has deminished as they became incorporated into the international productive system.

   B) First the need for colonial taxation expanded women's agricultural work to include cash crop production in addition to food cultivation and processing.

   As cash crop production expanded the land for food production decreased according. Women were walking further a field to collect firewood and to collect livestock food. The growth of cities too contributed to environmental degradation as timber was taken from the rural areas to build city houses, furniture and to provide fuel.

The migration of men to the cities has often meant an increase in women's work as they become de facto heads of households. Traditionally men planted and prunned trees that sheltered and protected the homes as well as providing animal feed, mulch and firewood.

C) Yes, I think development projects should try to educate the target population about the advantages of small families. But this message will be rejected or ignored unless the major reason for large families - poverty - is shown to be foreseeably controllable.

In other words since most development projects do not deliver the proposed improvements in life styles, their educational impact on "fertility control" issues will continue to be minimal.

Lastly education in family planning should shift to include men. Women do not need the convincing if their husbands are converted to the issue and practice.

I wish to comment on two issues that came up during the hearings but which I was unable to respond to in the committee members' rush to go to attend the Congressional roll call.

1. I was amazed at committee member Smith's tone and apparent moral superiority claim - "...we are dealing with a social structure that does not look upon its women the same way we do. Let's be honest. I mean, that is a fact. So it makes it difficult."

   With all due respect to the committee member, I wish to suggest that Congress votes no money to assist Africa or African women if this is the kind of attitudes some legislators have. Africa is not the first place to suffer famine or to have a population problem or to have poor people who have to work hard.

   After all exploitation of the American women is well documented and I would add they suffer injustices and mistreatments that I as an African women cannot comprehend.

   I bring up this point because during the hearings you showed concern over cultural imperialism.

2. Committee Member Schneider during the discussion on appropriate technology reacted to my story of the communal solar oven at the Busaisa village in Egypt by pointing out that it may not be appropriate for places where women cook late in the evening. I wish to add that the Busaisa communal oven was a good example of appropriate technology. The cells were used in conjunction to the local mud and wattle so that women were not themselves baking in the Sun as usually happens when solar systems good for North America, where the Sun is not overhead all the time, are exported to Africa. The Ethiopian women, Schneider attended to, rejected the solar ovens not because they cook at night but because it was forcing them into communal cooking which they did not want. African women have

increasingly been cooking at night because they often try to finish the extra domestic chores in the field such as collecting food, firewood and water before the sun sets. Cooking after sunset is a practical work managerial necessity and not an insurmountable tradition.

If food security is improved through appropriate technological means of processing and storage, women will be able to use the extra time to cook before sunset. Or better still why not export these energy storing solar cell systems.

As they say, If it is not appropriate it is not for women.

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Willie Campbell, President   Elise Fiber Smith, Executive Director

To: Subcommittee on Natural Resources, Agriculture Research and Environment

From: Elise Fiber-Smith, OEF International

Date: 6 December 1985

Re: Follow-up questions on testimony presented on 30 October, 1985

"In particular, how have African women been affected by the environmental degradation and the widespread drought, the acceleration of population growth rates, and the migration of males to the cities in search of work?"

In order to assess the impact of environmental degration and the widespread drought and the migration of males to the cities in search of work on African women, it is essential to understand women's pivotal role in almost all aspects of rural life. Where production and consumption, land (ecology) and labor, are dynamically linked in human survival, as in the African setting, disturbance in any of these factors directly affects her.

Time is a limited resource for African women. A typical day in a rural area begins before dawn and ends late at night and encompasses as many as sixteen hours of work. Her daily activities include agricultural field work, fetching water, collecting fuel, and taking care of the children and home, which are all necessary tasks for the family's survival. In addition, depending on the season, she is engaged in other farm activities such as storing, processing, and marketing of the harvest. All these compete for the woman's time and energy.

Let us first look at the impact of drought, desertification, and soil degradation: all are part of an insidious environmental cycle that dramatically affects Africans and particularly African women. Less fertile, often eroding, soil requires more intensive labor to wrest subsistence yields . A drop in the water table that comes with drought and loss of tree cover forces the woman to go farther for water. It has been reported that women have had to walk for four hours to find a source of water. It is no wonder, then, that some make do with brackish water that is nearby. A similar case can be made about fuelwood. Woman may have to walk for several hours to carry back 60 pounds of fuelwood that may only last her 4 to 8 days. For the woman, this means greater demands on her already full day. The cycle continues--increased environmental degradation, decreased crop yields, difficulty in getting water and wood, resulting in nutritional deficiencies, poor

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health, less capacity to work, and so on.

Once the soil is depeleted to the point where it can no longer produce, farmers then migrate to more fertile areas, which has created a growing class of displaced people, the majority of whom are women and children. The tragedy does not end when the rains finally come, because, desperate for food, the people will probably have long eaten their stored seeds. There may not be any resources with which to purchase agricultural inputs, if they are at all available to her.

Yet another factor that negatively affects women's lives, is increasing population rates. Improved health services have lowered the infant mortality rate, but there has been no compensating reduction in the number of children women are having. The result as more children survive into adulthood: soaring population rates that threaten the future of Africa by compounding the problems of food shortages, soil degradation, and male migration.

When men migrate to urban areas, the impact on the rural woman is manifold. Primarily, there is an increased workload as women take over the men's agricultural responsibilities. Traditionally, farm chores were divided up between men and women. However, when men leave the rural areas, their share is shifted to the women, with no compensating relief. The inevitable result, considering women's already excessive responsibilities, can be viewed in terms of trade-offs. For example, families have sometimes gone hungry at harvest time, not for lack of food, but because the woman was too exhausted to pound the grain or to fetch fuelwood. With increased responsibility in farm production does not come access to financial or other technical resources. As she works longer hours to eek out a subsistence level of life, her health suffers, and her productivity in turn decreases.

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WASHINGTON OFFICE
JAMES H. SCHEUER, M.C.

January 2, 1986

The Honorable James H. Scheuer
Chairman
Subcommittee on Natural Resources,
  Agriculture Research and Environment
U.S. House of Representatives
Suite 2321 Rayburn House Office Bldg.
Washington, D.C. 20515

Dear Congressman Scheuer:

Here are my comments in response to your December 20 letter and request. Your sub-committee is dealing with an important set of issues. If I can be of further help, please let me know.

Sincerely,

Ralph Smuckler

Ralph H. Smuckler
Dean

RHS/kb

Enclosure

Telephone: 517/355-2350 Telex: 650 277 3148 MCI Cable: MSUINTPRO ELSG

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QUESTIONS FOR THE RECORD

1. The Developing Country Task Force of the Energy and Environment Study Conference recently issued several recommendations to address the crisis in sub-Saharan Africa. Would implementation of the Task Force's recent recommendations help solve environmental porblems and enhance food production in Africa?

2. In the past, aid agencies such as the World Bank and U.S. AID have done little to promote low-resource, sustainable and appropriate technologies for sub-Saharan Africa.

   A. What accounts for the reluctance of aid agencies to promote appropriate technologies?

   B. Are there institutional factors which inherently favor funding large-scale traditional development projects over small low-technology ones? If there are institutional factors, what steps can be taken to change them?

   C. Do large bureaucracies and aid agencies have the flexibility to plan and implement projects on a local level? If not, how can the U.S. best assist such projects?

3. Do you see any evidence that aid agencies are changing their attitudes about appropriate technologies or are funding more appropriate technology projects?

4. How can we improve our efforts to involve local villages in the agricultural development process?

5. What steps could the U.S. agricultural research community take to develop and evaluate low-resource "appropriate" technologies?

6. Given the need to foster the development of African institutions and African research, what should be the role of non-African research institutions?

7. When technologies are developed outside of Africa, transferring the technology to those who must use it often presents difficult problems. What factors are important in the successful transfer of technology?

RESPONSE TO A SERIES OF QUESTIONS FROM CONGRESSMAN JAMES SCHEUER

Ralph H. Smuckler, December 30, 1985

1. In my view, the report of the Developing Country Task Force of the Energy and Environment Study Conference would indeed help to solve environmental problems and enhance food production in Africa. As a member of the Task Force, I participated in the discussions leading up to the statement of recommendations. As my testimony indicated, I am particularly in support of the recommendation of the Task Force to direct AID to review the status of research and development on environmental and related science and technology activity in African countries and the developing world in general. Such R & D capacity must be in place if these countries are to adopt technologies which are useful in their own setting. The whole thrust of the Task Force report urges that the focus of assistance be on sustainable development of increased food production. In view of the delicate environmental balance in Africa, it is important that as we increase food production we do it in ways which thoroughly respect the environment.

2. I do not agree with the basic premise that USAID, the World Bank, and others have done "little" to promote low resource sustainable technologies for sub-Saharan Africa. There have been, and are, many such attempts; but it is not easy to accomplish. In the case of AID, such efforts frequently flow through the effort of Private Voluntary Organizations which AID is supporting.

One of the basic problems in working toward the promotion of appropriate technologies, is that they frequently call for labor intensive efforts by the assistance personnel. Therefore, they require a different type of talent and determination in the aid agency than the larger, more sweeping program activity. Thus, private voluntary organizations are frequently good vehicles for promoting such technologies.

Furthermore, if such appropriate technologies are to be developed and promoted, and I strongly encourage that this occur, it will require an expansion of staff devoted to such efforts. Various types of restrictions on staff size in the field, etc., operate as constraints. Thus, there would tend to be institutional factors revolving around personnel costs and restrictions favoring large-scale, more traditional development projects.

As indicated, I do believe that the best way to promote aid efforts along appropriate technology lines is to increase the role of PVOs and other groups, including universities, in the effort. U.S. universities with AID support are now involved in a large farming systems effort related to Africa, and through this effort technologies appropriate at the grass roots level are the center of attention.

3. I have observed that AID is increasingly supportive of the effort of the Private Voluntary Organizations. If this is the case, it is attempting to encourage the development of appropriate technology in ways that could be useful.

4. The involvement of local villages is important, but very difficult and time consuming. The best attempt that I have observed, is at Comilla, in what is now Bangladesh. Under that particular scheme, agriculture cooperatives of various types were introduced as a result of the effort of leadership emanating from a rural development academy. Thus, an institutional framework was put in place, and a methodology was introduced which did indeed involve local villages in the acceptance and use of technologies which increased production and brought a better standard of rural life.

In Africa, the situation is even more difficult. The best efforts have been through the Peace Corps, PVOs, and university programs. University programs aimed at strengthening extension services of individual countries in ways which would involve rural areas and villages is an important approach. It requires adaptation from one country to another, but is well worth the effort over the long term. Social scientists should be involved increasingly in such programs.

5. I am not an authority in the field of agriculture, but my observations over the years would indicate that there are many on-going land-grant college attempts to develop and evaluate low resource "appropriate" technologies. These could be encouraged through funding channels such as university experiment stations.

6. The first step to foster the development of African institutions and African research is to develop a more thorough understanding of the quantity and quality of the on-going research and development effort related to science and technology. Beyond such an inventory and appraisal, however, the non-African research institutions could play a significant role of an institution building nature, and in the development of networks of researchers working on African problems. Non-African institutions could also provide training and advanced degree educational programs which would provide the African trained manpower necessary to conduct useful research and adaptation trials.

7. The institution building role referred to above is a traditional one which has worked successfully in many countries. It links together American institutions and organizations and those in the foreign setting in ways that are beneficial in both directions, but primarily result in the strengthening of the foreign institution. One can see the successful pattern in India and other countries of Asia, as well as outstanding examples in Africa itself. An institutional and organizational structure in the developing country suitable to receive and use (and adapt) external, useful technology is an essential. I refer to cooperatives, rural development academies, farmer's associations, youth clubs, universities, etc.

There are ways of developing African institutions and research, but none of these can be done over the short run and with low level of investment. What is required is determination, and that includes willingness to expend funds over a number of years to accomplish long term, sustained benefits.

Natural Resources Defense Council, Inc.

1350 NEW YORK AVENUE, N.W.
SUITE 300
WASHINGTON, D.C. 20005
202 783-7800

Western Office
25 KEARNY STREET
SAN FRANCISCO, CALIF. 94108
415 421-6561

New York Office
122 EAST 42ND STREET
NEW YORK, N.Y. 10168
212 949-0049

January 17, 1986

Hon. James H. Scheuer
Chairman
Subcommittee on Natural Resources,
 Agriculture Research and Environment
House Committee on Science and Technology
Washington, D.C. 20515

Dear Chairman Scheuer:

Thank you for your letter of December 20 concerning the October 31 hearing on Hunger and Africa. I appreciate your entering my statement in the record, and am pleased to respond to your questions. Here are the answers.

Question #1

Mr. Edelman, AID's Assistant Administrator for Africa, stated that H.R.2782 is not needed because AID is already undertaking the tasks required by the bill. Why do you recommend passage of H.R.2782?

Answer

AID is doing some of the things which would be required by H.R.2782. Most of the successful AID projects cited by Mr. Edelman (at pages 12-13 of his statement) are of the kind specified in H.R.2782: small-scale, resource-conserving projects carried out with the support and involvement of local people. Yet these are still isolated examples. AID needs to do much more. H.R.2782 would require AID to support enough projects of this kind to meet a significant part of the need and to provide numerous models for national governments and other aid agencies. This could go far toward making this kind of development the norm in Africa.

New England Office: 850 BOSTON POST ROAD • SUDBURY, MA. 01776 • 617 237-0472
Public Lands Institute: 1720 RACE STREET • DENVER, CO. 80206 • 303 377-9740

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Question #2

You are a member of the Developing-Country Task Force of the Energy and Environment Study Conference. Would implementation of the Task Force's recent recommendations help solve environmental problems and enhance food production in Africa?

Answer

The Task Force's first recommendation is enactment of H.R.2782. The other recommendations -- dealing with institution-building, training, reforms by the multilateral development banks, and other important matters -- also would be very helpful in addressing the long-term crisis in Africa.

Question #3

You have recommended that the U.S. Government adopt an overall plan for dealing with the long-term African crisis. Do you have any information about why the Administration has not already done so?

Answer

It is my understanding that President Reagan directed in the spring of 1985 that such a plan be prepared, and that a draft exists but is bogged down in the interagency review process.

Question #4

What additional contribution can the Peace Corps make to solving environment and resource problems in Africa?

Answer

Peace Corps volunteers are an excellent way of facilitating the kind of small-scale, decentralized development which is needed in Africa. The approaches outlined by Director Ruppe before your Committee seem sound. The Peace Corps should receive increased funding for its work in Africa. Enactment of H.R.2782, which would channel resources in part through Peace Corps volunteers, would help to accomplish this.

Question #5

What role can international environmental groups play in creating support, both in the developed countries as well as in Africa, for long-term sustainable development efforts?

Answer

Environmental groups in developed nations can help by publicizing the nature of the crisis, by supporting actions on the ground, and by influencing governments. Many African groups are engaged in public education and on-the-ground development activities. H.R.2782 would provide additional support for their efforts.

Question #6

In the past, aid agencies such as the World Bank and U.S. AID have done little to promote low-resource, sustainable and appropriate technologies for sub-Saharan Africa.

A. What accounts for the reluctance of aid agencies to promote appropriate technologies?

B. Are there institutional factors which inherently favor funding large-scale traditional development projects over small low-technology ones? If there are institutional factors, what steps can be taken to change them?

Answer

There seem to be two factors which account for the reluctance of aid agencies to support these technologies, and both can be described as institutional. First, aid agencies for a long time pursued a model of industrial development patterned on past events in countries like the United States. There has been a gradual realization by most agencies that this is not a suitable near-term model for Africa. But the alternative choice often has been to emphasize relatively large-scale, centralized agriculture. This too seems inappropriate in much of Africa. Yet the agencies have not yet begun to feature the small-scale, resource-conserving approach which does seem appropriate.

The second factor is that many aid agencies have to spend large amounts of money with a relatively small number of people. Big projects are the most "efficient" way to do this from a bureaucratic viewpoint.

These factors can be changed. The main thing which is needed is strong, consistent policy direction. If the Congress were to tell AID and, to the extent possible, the multilateral banks that small-scale decentralized development is to be favored, that would have a large impact.

A key step within the agencies is to bring in personnel with expertise about this "new" kind of development. It is also essential to find mechanisms for "delivering" small-scale development on the ground without excessive costs of administration. That is why H.R.2782 places so much emphasis on projects administered by private voluntary organizations or African nongovernmental organizations.

Question #7

Do you see any evidence that aid agencies are changing their attitudes about appropriate technologies or are funding more appropriate technology projects?

Answer

The biggest change came in 1973 when the Congress enacted the "new directions" amendment to the Foreign Assistance Act, directing AID to get out of capital-intensive development and focus on the "poorest of the poor." Since then, AID has begun to do some of the right things. However, AID needs a clearer mandate, especially concerning Africa, based on the lessons we have learned since 1973.

There may be some favorable trends in attitudes and funding within the multilateral development banks, but at best they are changing far too slowly. As stated in my testimony, the MDBs are still pursuing inappropriate kinds of development, and the United States should not provide increased support for their on-the-ground efforts in Africa unless there are major reforms.

Sincerely,

Thomas B. Stoel, Jr.

Thomas B. Stoel, Jr.
Director, International Program

TBS/cdl
cc: Hon. Claudine Schneider